ARMY ORDNANCE

VOL. XIV, No. 80 SEPTEMBER-OCTOBER, 1933

War and Peace in the Machine Age
George Stuart Brady

A Plea for Munitions Quality
Preston S. Millar

Early History of American Ordnance
Brigadier General William H. Tschappat

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J. S. Hatcher

The Weight of Gun Carriages
E. C. Goebert

Relativity of Pacifism
An Editorial

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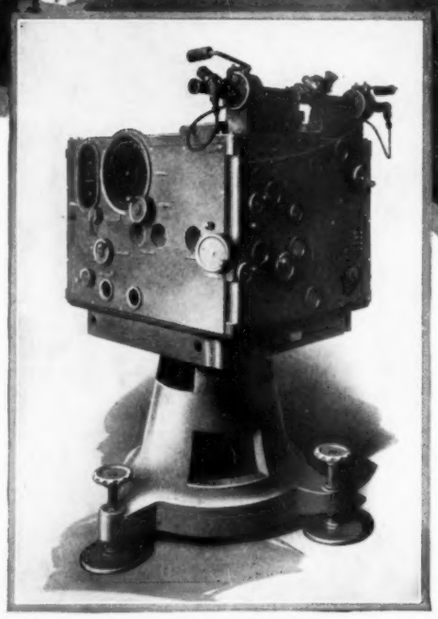

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"Notwithstanding the security for future repose which the United States ought to find in their love of peace and their constant respect for the rights of other nations, the character of the times particularly inculcates the lesson that, whether to prevent or repel danger, we ought not to be unprepared for it."—*President James Madison, December 5, 1815.*

The Army Ordnance Association

THE Army Ordnance Association is a national organization of American citizens pledged to industrial preparedness for war as our nation's strongest guarantee of peace.

The Association endeavors to keep alive an interest in and knowledge of the design, production and maintenance of munitions. Other than a few manufacturing arsenals—six in all—there is no peace-time industry for the production of ordnance. Should war unhappily come again, industrial America will be called upon to produce munitions in great quantity and of intricate and unusual design. In an emergency time will not permit careful study or long preparation for the production of munitions. The problem is one of vital concern.

THE Army Ordnance Association believes that the solution of this problem, based on experience, lies in an active organization at all times coöperating with the Government. The principal objective of the Association is an active membership of American citizens, on whom the duty of design and production of munitions will fall in war, who will have an accurate and authentic knowledge of the complex requirements of ordnance. "Peace insurance" in this form is the foremost aim of the Army Ordnance Association.

The Association is purely patriotic; it has no commercial interests, no political alliances, and no religious affiliations. It is not operated for profit: its income is expended in furthering its aims. Its officers and directors serve without remuneration.

ARMY ORDNANCE, the journal of the Association, is published solely for the purpose of disseminating information on the progress of our munitions developments so that American industry may at all times know its responsibilities to the common defense.

The objectives of the Association as set forth in its Constitution are:

To assist in effecting industrial preparedness for war as being one of the nation's strongest guarantees of peace;

To keep available the highly specialized knowledge necessary for arming the manhood of the nation by stimulating interest in the design and production of ordnance material;

To promote mutual understanding and to effect cooperation with American scientists, inventors, engineers and manufacturers in civil life and the regular and reserve officers of the Ordnance Department.

To provide, when required, the services of competent committees to investigate and report upon special ordnance subjects;

To assist in developing and maintaining an efficient personnel, both commissioned and enlisted, for the units required for Ordnance Field Service in the event of an emergency;

To commemorate the services rendered by the industry of the nation and by the officers and civilian employees of the Ordnance Department in the wars in which the United States has been engaged.

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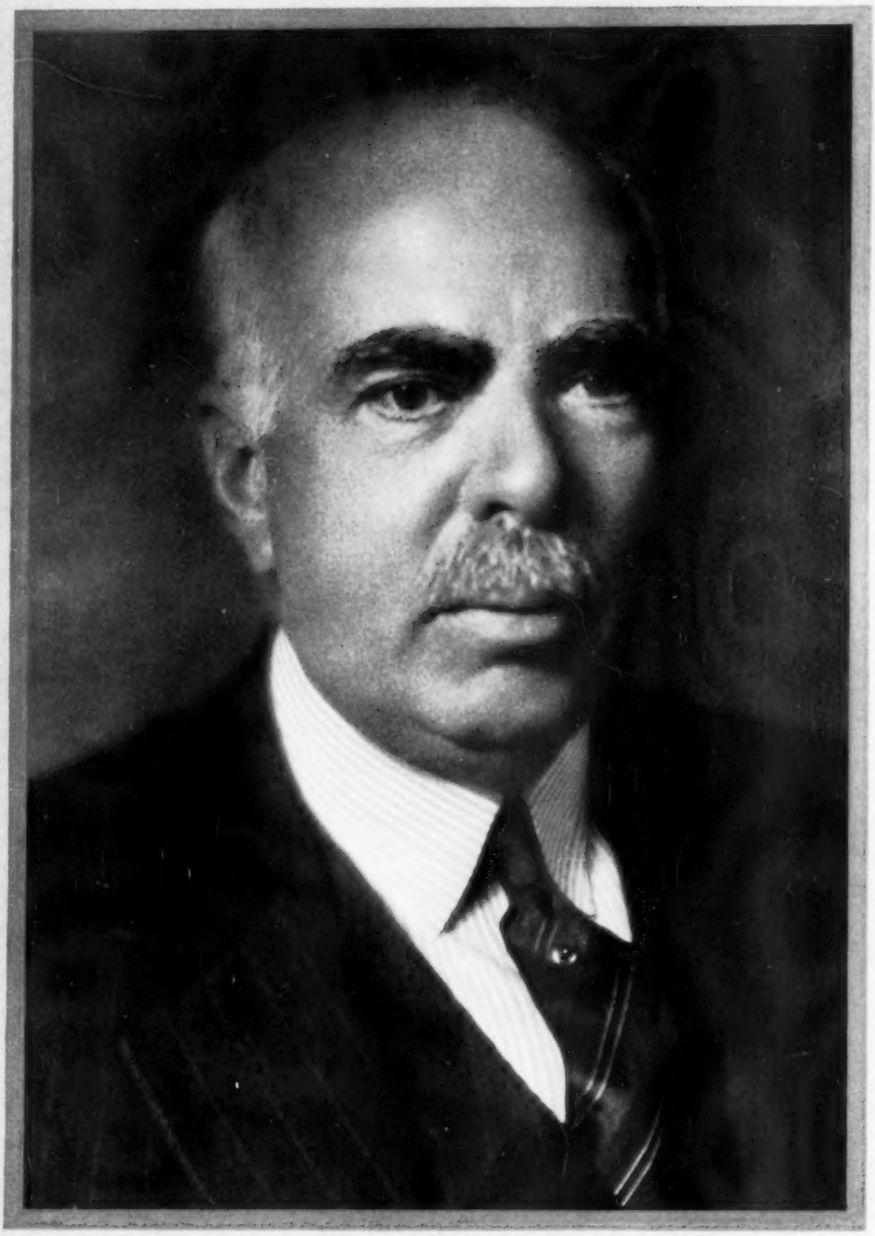

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ARMY ORDNANCE

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War and Peace in the Machine Age

A Forecast Based on Ancient and Modern Experience

By George Stuart Brady*

FOR the first time in nearly two thousand years the doors of the Temple of Janus, we are told, are about to be closed for a universal peace! The profession of soldier, in the minds of many, had openly come into disrepute in a great nation, and the mightiest central government in the world was about to reduce its army to the status of a police force. Enthusiastic youth riots in the universities against military training. Bellicose pacifists rise again as twenty centuries ago to "outlaw war" by proclamation. The peace movement today is gaining in momentum and determination. It has behind it the same logic of righteousness by law that put across the Prohibition Amendment. It has behind it, in many instances, the same organizations that put over that law, and the very same men and women head the peace societies.

The same paradox of demands for forceful policing of the world while calling for disarmament exists as of old. The militant pacifists are determined that America in every case of foreign aggression, of wrongs to the Jews, of oppression, shall "protest officially," make a "moral gesture," write a "firm note," or even inflict a boycott. The most rabid disarmament advocates and the most determined peace societies were the very ones who went on record in urging the boycott against Japan, a boycott that would have brought inevitable war. While our State Department publicly declared that a boycott would produce dangerous consequences, a powerfully set-up organization of women under the name of the American Boycott Association sent out a flood of feverishly warlike propaganda, and the pacifist Federal Council of Churches gave approval to the boycott. The names of the leaders in both organizations were the same as those in prominent peace societies pledged to "outlaw war." Once again, as twenty centuries before, an eagle is asked to spread its wings to protect all by its great and generous power, but like the eagle of old the wings are cut and it is fed indigestible and poisonous food. Happily, in recent weeks a new eagle has alighted on our country to reawaken a sane national understanding and coöperation.

HISTORY is said to repeat. Let us consider another age. It was the advanced and enlightened year 5 B. C. A New Order had been proclaimed, and enthusiasm stirred a great people. With joyous ceremonies the doors of the Temple of Janus were shut and barred. The god of war was to receive no more public homage. Five times before, Janus had seen the door slammed in that double face of his which looked two ways. On each occasion new outbreaks had unloosed the portals, but now things were different. The people demanded peace; pacifists stumped from town to town; women were freer than at any other time in history, and they demanded to be heard; writers elaborated on the horrors of war and the virtues of peace. Profitable trade was multiplying with all nations. No longer did patricians enter the legions; the honorable professions were only those of law, business, and the arts. A universal peace was proclaimed, and never before were there such auspicious prospects for its continuance.

Eighty million people, comprising the whole civilized world except Further Asia, were united with mutual treaties between states. Twenty major nations enjoyed independent governments under the protection of the Roman eagle in return for tribute in taxes and levies of soldiers. So impressed and friendly were the barbarian nations beyond the borders that whole legions of them were enrolled in the imperial armies. The Roman Empire was a League of Nations such as had been the dream of Alexander the Great, but never before realized.

On the noble Octavius, idol of the populace, and proclaimer of the New Order, the Senate had conferred the title of The August One, and made him dictator. Four hundred thousand soldiers guarded the borders from the desert sands of Arabia and Libya to the farthest shores of Lusitania and Belgica. Flotillas controlled the Rhine, the Albis, the Danube, and the far distant Pontus Euxinus. Three great fleets policed the Mediterranean, the "Internal Sea" of the League, and protected the ships that brought silver and copper from Spain and tin from Britain. Through Bactria and Scythia the caravan routes were open to bring in the silks, sandalwood, and electrum from China. The trade course skirting the Arabian shores was unmolested for ships to carry the spices and precious stones from Extra Indus. Ships passed into the Atlantic and traded far down the African coasts. There was no cause for foreign war because the eagle brought law and order wherever it set up its rule. Military rebellion was impossible because the army units were broken down and the commanders reduced to the status of police officials whose every gain accrued to the credit of the state.

Geometers surveyed and mapped the provinces. Roads were built to every outlying point, and regular post services were organized. Stately buildings and public works were put up in the cities. Accurate censuses were taken periodically and taxes justly apportioned. Religious freedom was accorded the practices of every sect, and only the human sacrifices of the Druids were barred. Robbery on the public highways was severely punished, and single traders could go freely everywhere. The Emperor himself traveled from

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A CORNER OF A FOREIGN FIELD THAT IS FOREVER AMERICA. BROOKWOOD CEMETERY OF THE AMERICAN EXPEDITIONARY FORCES, BROOKWOOD, ENGLAND.

province to province to make intimate contact with his people. Great writers, historians, poets, geographers, artists, made the Golden Age.

Peace was idealized. "No lasting possession is gained by the sword," wrote Rufus, "gratitude for kindness is eternal." The institutions of the allied nations were treated with respect. The Government even forgave the debts of those provinces that had suffered disasters. Citizenship was conferred on all who desired it. And Seneca expressed the humanity that permeated the empire: "Nature bids me do good to mankind be they freemen or slaves." The unemployed and the miserable were fed from the public treasury. Public baths and arenas were built. A great public library was planned.

But a few careful thinkers dissented from the popular idealism. They feared the debasement of the army to a mercenary police force. They dared to think that stroking the head of the serpent would not allay his sting. They saw in history the inevitable internal social catastrophe from the rise into power of a few men who were rapidly gaining control over the wealth and business of the world. They saw the future disintegration from the advance of "luxury, more terrible than war." They were sanguine on the doctrine of assured peace. These men, whom the ages were to crown as geniuses, were not popular at the time. They were treated with violence by the advocates of peace. It was an age of enthusiastic youth. Ovid wrote cynically, "Sometimes there is peace, but never an assurance of its continuance." Livius, the historian of the ages, recorded in his masterly work: "No great state can remain long at rest. If it has no enemies abroad, it finds them at home."

Rome has long since gone, rotted internally from the pride and greed and treason of the two hundred families that gained power over its economic lifeblood, and beaten flat by the foreigners who crowded over its borders as its army became an ineffective mercenary police force. The New Order brought extreme freedom for the individualism of wealth. The nobles grew in insolence, the people learned servility, the army became bands of lawless adventurers. Twelve centuries of continual warfare and barbarism followed before civilization could again begin to rear its head.

MUCH history has been recorded since that first noble experiment with peace, experience that should be valuable to the leaders of the nations. Never in the history of the world has there been a period when one emerging nation has not sought with all the powers of its ingenuity to climb to the top. When that nation is goaded on by an overwhelming necessity to find means of providing for an increasing population, the situation is more critical. When, now in this machine age, a nation thus fixed is spurred again by a remorselessly failing supply of foodstuffs for its people and raw materials for its industries, no power on earth, neither the majesty of leagues nor the sacredness of treaties, can check it from waging war, nothing except an actual donation of lands and resources by other nations. As with individuals, nations must have supplies, and without them they are dangerous, for, "It is useless, O Citizens, to argue with the belly, which has no ears."

Every day of this machine age the mechanical progress draws the world closer together into an economic unit. We learned something of this dependence of manufactures on materials during the World War, but what we knew then has become dwarfed by what is to come. So complex has

HERE LIES A PLEDGE OF LASTING FRIENDSHIP. MEUSE-ARGONNE AMERICAN CEMETERY AT ROMAGNE-SOUS-MONTFAUCON, FRANCE.

design become to reach mechanical efficiency that the simplest machine today depends upon a complicated materials procurement organization in the world. A simple household washing machine has materials from thirty-three countries on six continents. It can be made with less, but it will be more bulky and less efficient, and this age will not go backward to accept less. During the war of 1918 the seas were open to the shipping of the nations that won. In the next war the struggle to gain avenues of materials' supply and to destroy those of the enemy will be deadly. In the years before the next war the silent struggle to obtain control over materials will be intense and persistent.

Consider a few outstanding points of the present struggle of the nations for existence in the new machine age. Japan today has a population of 440 per square mile, Germany has nearly as great a concentration of population, and Italy has forty million people packed into an area considerably smaller than the single state of Montana. Less than twenty per cent of the area of Japan is suitable for economic agriculture, and the country has relatively few metals. Only the seizure of Korea a generation ago enabled Japan to rise to a place where it began to assume economic unity. For steel, the cornerstone of the age, Japan had to be subservient to America and Europe until it developed iron and coal mines in Manchuria. The ultimate securing of Manchuria was the only possible step for Japan to assure its position in a selfish world. That pagan nation had before it the examples of the Christian nations, in India, in Persia, in Africa, in Panama. The situation of Japan, mad enough if static, has been made progressively worse by the fact that its birth rate is thirty-five per thousand, or actually an excess of births over deaths nearly as great as the total birthrate of the United States. Italy's position is no less startling. In the words of Premier Mussolini, "Italy must expand or blow up."

Either Germany will be permitted to expand, or Germany will expand itself. Either Russia will be permitted to trade with the world without conforming to the ancient trade rules, or Russia will force its trade on the world. In Central Europe an impossible economic situation has been set up by idealists, and it is being maintained by standing armies and trained men in reserve supported with money voted by a nation that refuses to vote funds to pay the interest on old debts. In the meantime, as in ancient times, a mighty horde of "barbarians" in *Extra Danubius* train themselves systematically in the arts of the old civilization and glower on the ways of that civilization. These things are but a taste of the real state of affairs as fanatic groups clamor for peace, peace by law and proclamation, "peace by incantation."

WHAT are the arts of this old civilization as they pertain to war? It is only needed to review them to discover what can be done in the next war by those who take advantage of them.

The War of Secession, as far as America is concerned, was the last war of a now dead era. When the rising sun of April 12, 1861, saw the first shot fall on Fort Sumter to open a struggle that was to continue for four years, the twenty states comprising the "North" formed a union of nineteen million people that was self-supporting for any war conceivable under the then existing methods. Sugar, coffee, cotton, tin, and cinchona bark were almost the only items of supply not found within its borders, but with ample shipping, its ports open and those of the enemy blockaded, these were obtainable with ease. Such materials as rubber and manganese,

that were to become vital and indispensible in the new age, were not yet needed. The mines and factories of the North furnished everything needed for the simple ordnance.

But the industrial revolution had come, and with it the beginning of the mechanization of war. Hand to hand fighting with simple equipment was doomed; elaborate items of defense were to become as necessary as fighting weapons. Only because of prepared arsenals, by superhuman work to industrialize itself, and by patient endurance of the hardships of deprivation, was the agricultural South able to maintain itself for a long period against the industrial North. This war offered striking comparisons with 1776 and 1812. Washington had tramped his soldiers by the same weary methods used by Caesar eighteen centuries before. In the war of 1861 soldiers were carried to and along the fighting lines by railway. The new telegraph replaced the hard-riding horse messengers. Out of that war came the cartridge, the Gatling gun, the military balloon, the rockets and flares, the railway mount, and the armored ship. It was in the American Civil War that Count Zeppelin first saw and became interested in military flying. This war gave an indication that every product of the new industrial age would be turned to war use.

Six years after the close of that war Germany showed the world the ultimate in efficiency of old-era warfare, the machine-like precision of the new factory system applied to the moving of a million and a half men. Then, progressively, the steps for machine-age war were built, though no nation, not even Germany, realized the powers of destruction in its hands. Breech-loading guns were followed with more powerful propelling powders. The sulphurous powder that choked the gunners and hid the view was replaced by smokeless explosives. The canister and grape were superseded by the destructive high-explosive shell. The Gatling gun with its many revolving barrels was replaced by the machine gun. The new strong nickel steels were applied at once to defense armor. Coast defense guns became mechanically-working machines set in massive concrete.

THE American war of 1898 against a weakling nation gave little opportunity to demonstrate machine war, and the new efficiency of the weapons was crowded out of the public eye by a sensational foot charge against a blockhouse that could have been crushed by a few shots of a heavy gun. The world had as yet no conception of the coldly brutal mechanization to which every phase of war would be reduced. War still meant romance to the public, the waving of flags over the ramparts, and the dash of a brave column across a field with a flag at the head.

The Boer War of 1900 likewise gave no indication to the public of the new mechanized combat. Because of the unpopularity of that war at home the British Government, instead of organizing its mechanical resources, had to be content with pouring soldiers into the field until they outnumbered the entire combined adult population of the Transvaal and Orange Free State. Only in the Russo-Japanese War did the teeth of mechanized war begin to show, although Russia could not exercise her real power because of internal disturbances, and Japan was not as yet independent in iron and coal. The war of 1905 was one of big guns, trenches, and armored ships.

That the concentration of resources for a great war was apparent throughout the decade before August, 1914, can now be seen. The growing center of force of one "balance of power" was in Germany, which country was being pushed by an irresistable need of expansion. "War lords" were an effect rather than a cause, economic needs furnishing the energy to impel them on. Jealously she watched the growth of British imperial domain, knowing that her own need was just as great. Germany launched a naval program that was pushed rapidly during the Boer War, which war, incidentally, fanned the fierce antagonism of this new empire-builder against the old empire-builder, England. With the observance of the Russo-Japanese campaigns Germany began the construction of strategic railways, the building of big guns, and the intimate study of digging-in for trench warfare.

The world, soothed and lulled by fanatic idealists, saw nothing. The writings of the pacifists during the five years before the war now forms pathetic reading. Anyone who dared to differ from the popular ideal of peace by proclamation was "bloodthirsty," and a "militarist." The massing of armament in Germany, the demand of Germany for a coaling station in Morroco in 1905, the construction of the Bagdad railway and the unprincipled support of Turkey by Germany as a buffer against Russia and against British interests in the Near East that might interfere with the Teutonic economic needs, all these were the outcrops of the dire necessity of a government to assure that its growing population would be supplied with needed material.

THE roar of the big guns before Namur opened the first machine-age war, but no one saw the slaughter that would come. Public opinion took the easy path of the pacifists, and dreamed of a civilization that could not permit great slaughter. At worst, the popular idea was of a tremendous and efficient movement of arms that would terminate in a few months. Even the Germans never intended to kill great numbers of men with the new machinery of war. They did not expect the foolhardiness of standing against their organized mechanization. Not the maddest of Prussian militarists would have engaged in the war if he could have foreseen the 7,485,000 actual battle deaths, and the 9,900,000 soldiers facing each other like cornered tigers on the Western Front four years after the struggle began.

Military strategists agree that Germany miscalculated, but so did the world, and so will it be again. Guns had been increased to ponderous and unwieldy dimensions, but no man dreamed of sixty thousand guns firing a rain of exploding shell almost continuously day and night. No one foresaw the changed attitude of mind with the coming of mechanization. In the Civil War soldiers spent their evenings gayly fraternizing and trading with their enemies of the day. After 1914 men stood alert all night in trenches waiting for some new tool of destruction to be launched at them. The world up to 1914 still thought in terms of the mass precision movement of soldiers that was so successful in 1871; it did not think that the civilized Christian nations could ever permit millions of men to lie month after month in blasted mud drenched with poisonous chemicals.

Popular imaginative writers who really knew little of mechanics had envisioned the destructive effect of the submarine, the terror of the long distance gun, the bombing of cities. But powerfully militant pacifists saw written agreements that these things would not happen, and they believed in and worshipped the written law. Governments and ex-

perts were too practical to dream of futures. The rifled shell proposed by a French artillery officer was thrown aside and the model lay in a museum within a few hundred feet of the spot where fell the rifled shell from the 70-mile gun. When, a few years before the war, the British War Office had been asked to provide funds for the building of a 50-horsepower engine for an experimental military airplane, it had replied that such engines were impractical and too expensive for war use. Experts based their ideas of mechanized war on what they had seen in the Russian war ten years before, just as they now think in terms of the war of 1918, fifteen years ago. As no one would believe the tremendous ratio of increase from 1904 to 1914, so now no man cares to visualize frankly the destructiveness of weapons and the increasing vindictiveness of man that will come in geometric ratio to the increase in mechanization.

At the outbreak of the war in 1914 the submarine was in its infancy as a scouting ship. The airplane was a crude contraption incapable of difficult maneuvers or of carrying guns, and which only four years before had made the first long flight of 150 miles. High elevation of guns for long distance firing had been proposed and rejected as impracticable. The Germans, taking the initiative, calculated merely on another war of vaster proportions with heavier weapons. No one envisioned the realities of the destruction of a million tons of shipping every month by the submarine, or the cold-blooded dropping of depth charges to destroy in an instant whole crews of these undersea boats. None could see that in two years England alone would have a thousand factories building airplanes to haunt the battlefronts. None foresaw the steel tank, the armored cars, the long-range guns, the deadliness of the machine gun, the automatic rifle, the storms of poison gases. Before the war the United States Army called for only five machine guns per regiment, but at the end of the war there were 36 machine guns per regiment, or more than seven times as many.

NOW a New Age is to have peace, peace proclaimed to be existent by merely destroying the weapons of war, by signing contracts that none but the dupes will keep. In 1931, surrounded by leagues and treaties and a seemingly popular desire for peace, Great Britain spent on armaments 42 per cent more than in 1913, France 30 per cent, Japan 142 per cent, Russia 130 per cent, and Italy 44 per cent. The tank has become a demon of offense, a tank brigade of 650 men now having the fire power of an old division of 20,000 men. The airplane now carries heavy guns or ponderous bombs, and can fly non-stop from Moscow to New York. Men impelled by the fatalistic creeds of Asia, or by the fierce hatred against capitalistic rule, will drive these ships loaded down with explosives into the hearts of communities without fear of their own destruction in the deed. Japan has in the Tokyo Aeronautical Research Institute the best equipped flying institution in the world, and it has 30 aircraft factories, the Mitsubishi plant alone, for military planes, covering 59 acres and employing in these times of peace 3,000. Russia, guided by German aeronautical technicians, increased its flying mileage 20 times in eight years.

But those are but some of the *known* tools of war. What of the unknown that will come when the attention of engineers is turned to making war? Within a few months after a declaration of war involving industrial nations the expensive big guns will be obsolete, and will be replaced by self-propelled projectiles that will scatter high explosives and deadly chemicals over industrial cities hundreds of miles apart by a mere plotting on a chart. The powerful electronic waves now used to sterilize foods will be turned in huge sheets of death to wipe out whole populations. Idealists will say that this cannot be permitted. History will say that man, when his passions are aroused, is the most cruel of all living animals.

But peace does not lie in the destruction of armies, any more than civil order lies in doing away with city and state police forces, nor does it come from treaties and promises of the nations any more than does civil order rest in treaties with irresponsible men. In 1913 Chauncey Depew, refusing to join in the discussions on disarmament at the International Peace Conference at the Hague, referred to disarmament as "tomfoolery," and called peace under present conditions an "iridescent dream." Last year Stanley Baldwin calmly told the House of Commons that we are preparing for another war with a "wholesale slaughter of noncombatants," but it made as little impression as the warnings of Noah. He did not refer to the building of armaments, but to economic rivalries. The handwriting is on the wall as it was in 1913, but the feast goes on and the pacifist dancers lull the world into a lethargy.

A MERCENARY low-order army on a police basis marks the beginning of the end of a nation; an aggressive machine-like army of threatening size is an invitation to competitive armament. Between the two, an ample military establishment of an honorable high class is a necessity for order and peace. No league can be effective to stop war unless it has the powers of a super-state. The sect of pacifists who would "outlaw" war will not pay the price by giving up nationality and providing a super-state army. These fanatics, ignorant of the causes of war, desire the government to interfere with the actions of other governments, without seeming to understand that only the power to have commands executed ever received respect on this earth. Today, dictatorial cautions of the American Government may be obeyed because nations saw the terrible power of the industrial United States when aroused in the war of 1918. With America disarmed the cautions of its Government to other nations would be as disregarded as an international command issuing from the ancient capital at Pekin.

Will the advance of science in the machine age bring peace? If the present world systems continue there will be more world wars, wars that will be on vaster scales than anything yet dreamed of. Disarmament will avail nothing because as science advances an industrial nation can turn quickly to converting its machines into instruments of destruction, and because with the nations disarmed the bickering will be increased and the secret plotting more deadly. The "land hunger" of the nations during the nineteenth century that caused wars and the looting of Asia and Africa is replaced in the machine age by a materials' hunger. And hunger is a terrible driving force; "Hunger knows no friend, no relation, no justice, no right, is remorseless, and capable of no compassion." Peace in the next few generations of the machine age, at least, will be had only by those equipped to maintain it. Neutrality will only be accepted from those peoples of the world with power enough always to maintain respect.

Early History of American Ordnance

A Chronology of Munitions Supply in the United States, Part III

By Brig. Gen. William H. Tschappat*

As one looks back to the ordnance situation during the American Civil War, with the improved perspective of hindsight, he is struck by two facts:

a. The breech-loading rifle was on the verge of being perfected. Fairly satisfactory breech loaders had already been used, not only abroad as by the Prussians, but in our own service; the Hall rifle had been manufactured in large numbers and had had a long tryout under actual war conditions. Yet the war was fought, on both sides, chiefly with muzzle-loading guns.

b. Similarly, the rifled cannon was on the verge of superceding the smooth bore. But smooth-bore artillery, almost alone, constituted the gun power on both sides.

It is profitable for us to look back and try to sense the reasons for this apparent lack of enterprise in the adoption of new and improved weapons so that mistakes, once made, may not be repeated in any future emergency which may confront the United States.

As I have stated, the manufacture of the Hall rifle ceased soon after the death of Captain Hall in 1841. I have found no evidence at all as to why this was the case. In fact, I have found nothing even as to its performance except a parenthetical aside of General Gorgas' (Chief of Ordnance of the Confederacy). In listing types of weapons on hand in the Confederacy on the outbreak of the war he inserts after Hall's carbines the statement: "A miserable apology." If we assume that Hall's weapons were unsatisfactory to troops, we are confronted with the dilemma of explaining why the Government should have spent much money through a long period of years in making them. The fact that their production was stopped so quickly after Hall's death does, however, lend support to this view, and it is certain that from the adoption of the Springfield muzzle-loading rifle-musket, caliber .58, 1855, through the Civil War until 1866 this was the standard gun of the United States service. Nor does there seem at any time to have been any great demand from the army for a general change to a breech-loading system.

An interesting side light is thrown on the regard in which this weapon was held by the fact that the British War Office sent men to this country to study the Springfield rifle prior to the adoption of the then current Enfield, and had taken a mechanic from Springfield Armory to be master armorer at the Enfield works, as well as others to take charge of various departments, and had the machinery for the Enfield armory made near Springfield from United States patterns.

Ordnance of the American Civil War.

Officers of the 69th New York Infantry and one of the guns at Fort Tenleytown, near Washington, D. C.

There were, of course, three methods possible of adoption for the procurement of arms by the United States for use in the Civil War. They could be manufactured at the Government armories, they could be purchased in this country of civilian contractors, and they could be purchased abroad.

As a matter of fact they were all resorted to. To begin with, there were on hand and available in arsenals which remained in the United States some 420,000 of the old, smooth-bore, caliber .69 muskets which were equipped with percussion locks, and about 35,000 of the caliber .58, Model 1855. The Springfield Armory, at the beginning of the war, had a capacity for making 800 muskets a month. Its capacity was rapidly increased so that it turned out 6,900 in October, 1861, and was expected to produce 200,000 in the year 1862.

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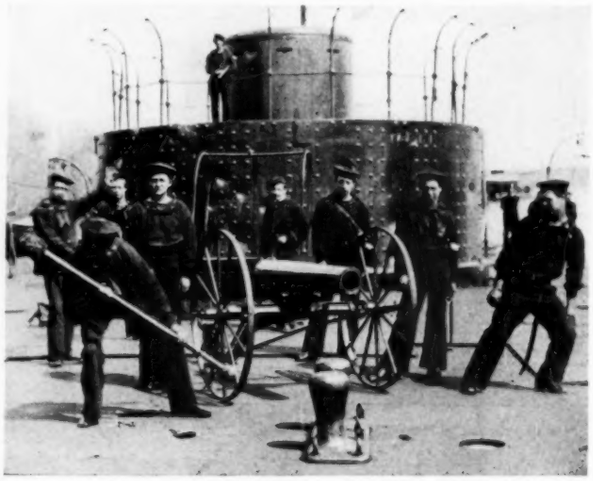
LOWER BATTERY AT THE U. S. MILITARY ACADEMY, WEST POINT, N. Y., SHORTLY AFTER THE SPANISH-AMERICAN WAR.

MEXICAN MORTARS IN THE TROPHY GARDEN AT THE U. S. MILITARY ACADEMY, WEST POINT, N. Y.

Contracts were entered into from the beginning with American contractors for arms. Some of these contracts were for existing stocks which were in private hands, but the majority were to be of new manufacture. By the end of 1861 orders had been placed for the following rifle-muskets: 979,000 of the Springfield, caliber .58; 3,500 of Burnside's breech loading; 25,000 of Marsh's breech loading; 10,000 of Spencer's breech loading.



Scene on the Deck of a Monitor.

It is to be noted that three types of breech loaders were included in addition to the Springfield guns. The Spencer weapon seems to have achieved considerable success. It used a brass cartridge case in a tubular magazine which loaded from a hole in the butt plate. It could be fired rapidly, about 14 times a minute, from horseback or slightly more rapidly from the ground. It was this weapon which led the Rebels to say that the Yanks had a gun which they loaded on Sunday and shot all the week.

Purchases from abroad were resorted to as a temporary expedient to bridge over the time until a sufficient supply of weapons could be obtained from domestic sources. Purchasing was poorly organized. The situation was complicated by the manner in which purchases were handled. Not only the authorized agents of the War Department, but officers without authority, governors of states, officious foreign ministers, private citizens, profiteers as well as patriots, and, last but not least, representatives of the Confederate government, invaded Europe to secure arms. It seems to have been somewhat of a sellers' market. The demand found a ready supply, of a sort. European nations had been rearming. Prussia had adopted the needle gun and other nations had gone to recent patterns of muzzle loaders. Consequently there was an abundant stock of cast-off material to choose from.

By the middle of 1862 the United States had purchased about 738,000 European weapons. Of these, about 165,000 were Enfields and French official types and thoroughly good guns. The remainder were a conglomeration of Austrian, Prussian, Belgian guns with some 200,000 listed simply as "foreign." The Conte de Paris seems justified in his statement that "the refuse of all Europe passed into the hands of the American volunteers." It is fair to state, however, that this was a temporary condition and the Union forces were soon rearmed with good rifles of the muzzle-loading type.

Had the United States concentrated its efforts upon the production of the Spencer rifle for the entire Army the course of the Civil War might have been greatly changed. But those in authority at the time did not have the advantage of our point of view. They had a well tried and entirely dependable rifled weapon in the muzzle-loading Springfield. The breech-loading magazine weapon, using a metallic cartridge case, was new and untried. It was not a time for hazardous experiment. Yet it does seem that, when once the Spencer had proved itself in the actual stress of battle, its production could have been pressed with much more vigor. As it was, the cavalry came gradually to be armed principally with breech-loaders and the infantry in the main retained the muzzle-loaders.

The telescopic sight made its first appearance at least as early as the Peninsular campaign. It was said, in the hands of experts, to be infallible at three-fourths of a mile and good at a full mile. One war-time story has it that at Edward's Ferry, 70 men repelled a charge of 1,500 of the enemy and drove them from the field with a loss of over a hundred killed, at the same time none of the defenders receiving as much as a scratch. The particular weapon used for this purpose, however, had certain drawbacks for field use. Weighing something over 30 pounds, it was at its best when fired from a rest on a parapet.

The first practicable machine gun was brought out by Dr. Richard Gatling in 1862. In this gun a number of barrels (generally 10) were arranged around a central axis in the form of a cylinder. When the cylinder was rotated each separate barrel was loaded and discharged in turn. Cartridges were fed to the gun in various ways. In one scheme a hopper was provided above the gun from which the cartridges slid by gravity into the mechanism. This gun was employed to a limited extent in the American Civil War. The first Gatling guns had a rate of fire of about 250 to 300 shots a minute. Later models fired as many as 600 shots per minute. The Gatling gun was a thoroughly reliable and effective machine. It had been superseded by later automatic machine guns which are much lighter and which are not subject to trouble from a "hang-fire" cartridge.

The supply of cannon offered no great difficulty to the United States. The Civil War was primarily an infantryman's war, as shown by the fact that, although over 4,000,000 small arms were issued to troops between 1861 and 1866, less than 8,000 cannon were issued to the army in that time.

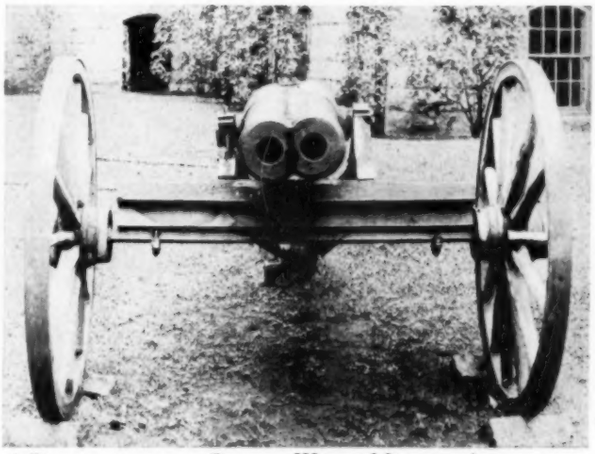
I have already referred to the fact that Gen. T. J. Rodman had devised an improved method of casting cannon by cooling the molten iron by the circulation of water through coils in the bore, so that certain defects were avoided and guns otherwise superior to those made by the older methods were produced. This work had been done at Watertown Arsenal before the war and Rodman guns were made and used during the war in sizes up to 15 inches.

The Whitworth system of rifling had been successfully evolved before the war and some Whitworth rifled cannon, purchased in England, were used during the war and were popular. The system, however, was not adopted for general use. Remarks of General Gorgas in this connection are pertinent: "The simplicity and certainty of the ammunition of (the) smooth bore, its capacity for grape and canister, its good range and moderate draught, as it was not too heavy for four horses, were certainty strong reasons in its favor. At

the distances at which the serious work of the artillery was done, it was an overmatch for rifled artillery."

The provision of ammunition seems to have given the North no great trouble. The markets of the world were, of course, open to it, and there appears never to have been a time when the Army suffered from an insufficient supply.

According to the official records over 90,000,000 pounds of lead, nearly 13,000,000 pounds of artillery projectiles, and 26,400,000 pounds of powder were issued to the Union Army during the war. (Although accurate statistics are not available as to the number of Confederates killed, it has been estimated that it took something like 900 pounds of metal and 240 pounds of powder to kill one Confederate.)



A DOUBLE-BARRELED CANNON WHICH MADE ITS APPEARANCE DURING THE AMERICAN CIVIL WAR.

DURING the period between the close of the Civil War and the outbreak of the World War, there was a changed tempo in the rate of development of weapons of warfare. Especially was this the case in connection with artillery and artillery ammunition. This quickening in ordnance development was closely related to the corresponding ever-increasing rapidity of the development of science and industry.

The Prussians had pioneered the way by the introduction in 1841 of the needle gun (invented by Dreyse in 1838). This was important as being the first use of a breech-loading system approximating the modern rifle. This weapon had a bolt action and was fired by a long needle which, when the trigger was pulled, was driven by a spiral spring through a guide hole in the front of the bolt and, passing through the powder charge, struck and ignited a primer on the base of the projectile.

Spencer's carbine, which had been used in large numbers by the Federal cavalry during the Civil War, employed a metallic cartridge case. This furnished a perfect seal against the escape of gas to the rear as well as a rigid carrier for the primer which could now be struck directly by the blow of the firing pin.

The British in 1867 were the first to adopt a breech-loading system using a metallic cartridge case. This system (the Snider) consisted of a hinged block which rotated to the right about an axis parallel to the bore. The cartridge was inserted in the chamber, and the block, carrying the firing pin, closed behind it.

The first breech-loading Springfield rifle was the model 1866. This was a caliber .50 weapon using a center-fire, brass cartridge case with a 450-grain bullet and 70 grains of black powder. It was derived from a model submitted by E. S. Allin, master armorer at Springfield Armory in 1865. The weapons were actually constructed by altering the muzzle-loading musket, Model 1863. It had three grooves with a twist of one turn in 42 inches. A receiver was screwed to the rear end of the barrel and the breech block was hinged to the receiver at its upper, forward end. By pressing a thumb piece upwards and forwards with the right thumb, the breech block was also thrown upward and forward until it rested on the receiver. An extractor threw the empty shell out. After inserting a new cartridge, the block was closed down, locking itself automatically.

In 1873, the gun was improved and the caliber reduced to .45-70-405. This weapon was officially adopted for the use of the U. S. Army. Later the weight of the rifle bullet was increased to 500 grains, the 405-grain bullet being retained for use in the carbine. The last of the old single-shot, breech-loading Springfields was the model 1888 with a rod bayonet. The Springfield was a very efficient and effective weapon. Its simple and sturdy breech mechanism could be operated so rapidly that, until smokeless powder came into use, there was little need of going to the magazine arm.

Closely allied with the development of the breech-loading rifle was that of the magazine weapon. In fact, Spencer's carbine had a tubular magazine containing seven rounds of ammunition. Another early magazine rifle was the Winchester which appeared in 1865. This weapon was used to some extent by the Turks in the Russo-Turkish War of 1877-78. Germany, however, was the first great power officially to adopt a magazine rifle for its troops. This it did in 1884 by converting the old Mauser of 1871 into a magazine rifle holding eight cartridges in a tubular magazine.

The French adopted the Lebel magazine rifle in 1885 and at the same time secured the advantage of the use of smokeless powder. The early Lebel had a tubular magazine under the barrel. It was the first military rifle to use smokeless powder. Austria, in 1886, adopted the Mannlicher .433 rifle with a straight pull bolt. This weapon embodied Lee's box magazine and incorporated the steel clip loader. In 1888 the bore was reduced to .315 and in 1890 smokeless powder was used, the sights being regraduated to suit the new propellant.

The United States adopted the magazine and smokeless powder in its official infantry weapon in 1892 when the caliber .45 Springfield was displaced by the caliber .30 Krag-Jorgensen which was a bolt-action weapon with a box magazine holding five rounds. It was, however, not clip loading but each round had to be inserted separately in the magazine.

Unfortunately, funds did not become available to manufacture a sufficient quantity of Krags to arm the entire forces called to the colors in 1898. At the battle of El Coney it was found necessary to withdraw a regiment of Massachusetts volunteers because the old black powder Springfields with which they were armed were ineffective against the Spanish Mausers and threw up clouds of smoke which revealed their position to the entrenched enemy.

In 1903 the present Springfield was brought out. This is an adaptation of the German Mauser and is generally

considered to be without peer as a military weapon today. Many readers of Army Ordnance have handled this weapon and I shall not go farther than to point out that its length is such that it is found practicable to use the same weapon both for foot and mounted troops, whereas, with the older weapons, it was necessary to provide a rifle for foot troops and a shorter carbine for the mounted services.

Although the United States appears to have been regrettably slow in adopting a magazine weapon with smokeless powder and clip feed, it should be pointed out that the board of officers created by Congress in 1872 and which recommended the adoption of the Springfield single-shot, Model 1873, expressed the opinion that the adoption of magazine guns for the military service of all nations was but a question of time and recommended the manufacture of a small number of Ward-Burton guns for a field trial. Unfortunately, the appropriation bill for the fiscal year 1873 contained a provision prohibiting the manufacture of guns for trial and nothing was done. One can but speculate as to what would have happened if the entire amount appropriated, $150,000, had been expended on the development of a new weapon instead of on the manufacture of the then current Springfield. Certainly the United States would have been entirely armed with a magazine weapon long prior to the Spanish-American War.

WHEN the Civil War started there was a fairly ample supply of Ordnance matériel for the initial equipment of the troops first mustered into service, but as the conflict grew in magnitude and as munitions were rapidly consumed in battle shortages developed and it soon became evident that every available agency which could supply munitions would have to be used. The arsenals were used to their full capacity and orders were placed with industry throughout the North. Orders were also placed abroad for large quantities of matériel.

As in the Mexican War, the general organization of the Department remained the same except for expansion in size. The arsenals and depots away from the theater of operations were in charge of the Chief of Ordnance. The depots and other Ordnance activities in or near the theater of operations were completely at the direction of the commanding generals of the armies. The business of the Ordnance Department, except in the field, consisted in placing contracts, operating the arsenals, inspecting matériel under contract, storing it and issuing it as required. The activity was of the same order though on a smaller scale than that of the World War.

The great advances in artillery in the period following the Civil War were in part due to the impetus of the war, but also in a very important measure to the strides made in the manufacture and use of steel. Among the first of these advances were those of breech-loading and the use of rifling and elongated projectiles. This was tried with cast iron guns but not with great success. A tougher metal was necessary. The principle of hooping guns had been tried in Belgium as early as 1830. General Rodman got the same effect by internal cooling in a cast iron gun about 1855. The principle was first applied to guns issued to our service about 1885, in the case of the 3.2-inch field gun which also incorporated the French DeBange interrupted screw breech mechanism.

Dating from then all of our guns were made of the steel breech-loading type. This (1888) was the beginning of the rearmament of our seacoast defenses with heavy guns. A $5,000,000 order for guns of 8 to 12-inch caliber was placed with the Bethlehem Steel Company about 1895 and orders were placed with Watervliet Arsenal, which was greatly expanded and re-equipped for the purpose. The rearmament of the coast defenses with these guns of vastly greater power than those previously used called for mounts which would stand the increased recoil. For this purpose the hydraulic recoil brake, recently developed in Germany, was adopted. There was a long discussion beginning about 1870 as to the best type of mounts for seacoast defense. The disappearing type of mount received favorable consideration and beginning about 1896 installation of the new guns, many on this type of mount, commenced in our seacoast defenses.

THE Spanish War was a ripple on Ordnance work when we look at a century of it, although activity was great for a time and there were shortcomings due largely to our lack of war reserves of rifles and artillery and their ammunition.

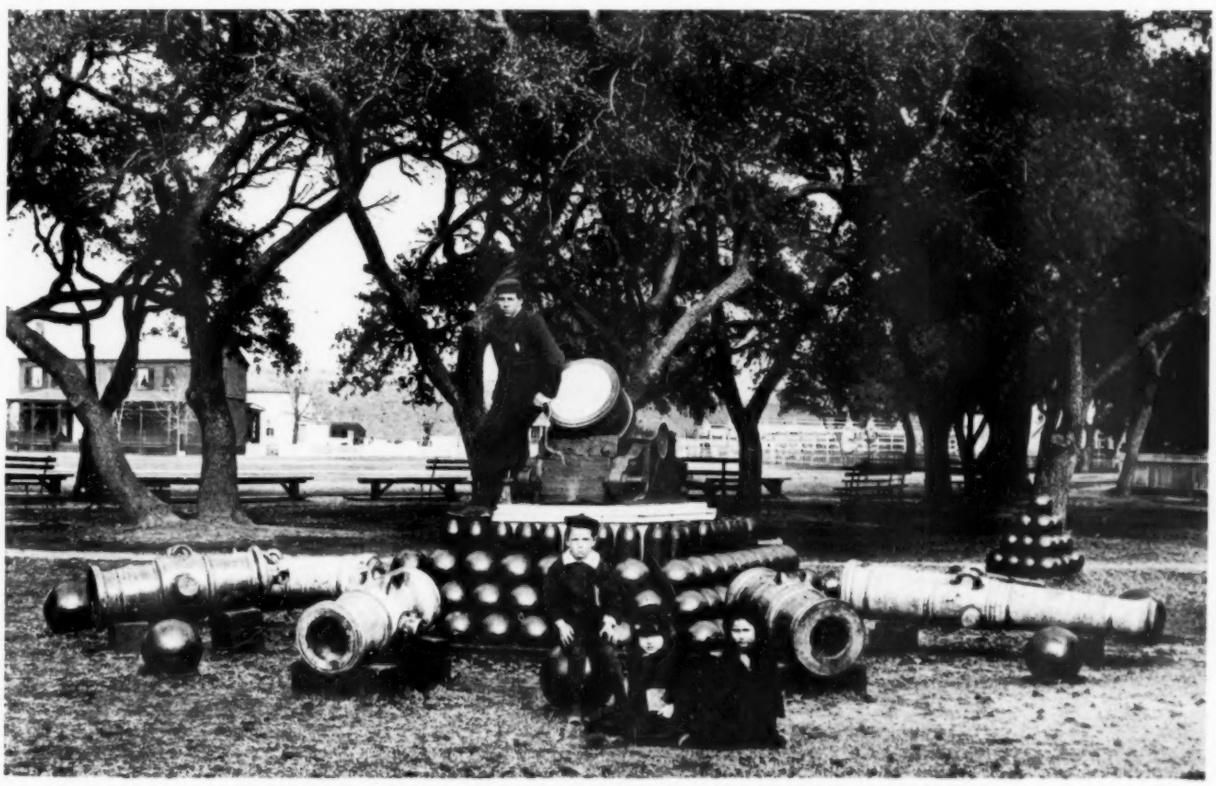
Smokeless powder and high explosives came into our service in the 'nineties with steel cannon. We first adopted smokeless powder of the nitroglycerine-nitrocellulose so-called double base type, but changed after a few years to the straight nitrocellulose type. With slight modification this composition of propellent powder was used during the World War.

It is interesting to note that the high explosive shell filler adopted at that time is still our standard for large caliber armor-piercing projectiles, though it has been replaced by TNT for other types of projectiles.

At this time, about 1896, there was great activity in all countries in the development of field or mobile artillery. The use of breech-loading cannon with fixed ammunition had greatly increased the rapidity of fire of each individual piece and thus increased the efficiency of the artillery. In our own service our 3.2-inch guns did not use fixed ammunition and the lack of demand for that ammunition instead of the separate-loading type was probably largely due to the fact that in guns mounted rigidly on their carriages, as was the case with the 3.2-inch guns, the gun and carriage recoiled together some fifteen or twenty feet at each round and it was necessary to run them into the firing position before firing the next shot. This limited the rapidity of fire, which would not have been greatly increased even had fixed ammunition been used. In the decade from 1890 to 1900 experiments were made abroad and in this country on the use of hydraulic recoil brakes on mobile guns. We applied them before the end of the century to mobile guns of the siege and heavier types. The discovery that a sufficient lengthening of the recoil of the gun on the mount would permit the mount to remain absolutely stable when the gun was fired is due to the French. The French are also to be credited with the development of the hydropneumatic recuperator in which a compressed gas replaced steel springs for running the gun into the firing position on the mount. The French 75-mm. gun, Model 1897, was brought out in that year, but the details of its construction were closely guarded and remained unknown outside of France until the World War.

In 1900-01 a competitive test of various types of field artillery guns was conducted first at the Sandy Hook Proving Ground and later by the Field Artillery. Entries were

ARMSTRONG GUN IN THE TROPHY GARDEN AT THE U. S. MILITARY ACADEMY, WEST POINT, N. Y.



TROPHY MORTARS AND CANNON AT FORT MONROE, VIRGINIA, IN THE 1880's.

made of two guns designed by Col. Isaac Lewis, later the inventor of the Lewis machine gun, one by the Ehrhardt Company of Germany, two designed in the Ordnance Office, one by Vickers in England. The long recoil guns were those submitted by Colonel Lewis and one of those designed by the Ordnance Office, and that submitted by Ehrhardt.

It became apparent in the very beginning of the test that the long recoil guns, about 40-inch recoil, permitting the mount to remain stable, were so far superior to those of 8 or 10-inch recoil that the latter were practically eliminated from the test. The gas recuperator guns of Colonel Lewis gave trouble in leakage and the best results on the whole were obtained with the spring return guns of Ehrhardt and the Ordnance Department. As a result of this test a new design was started incorporating some of the features of the Ehrhardt and the Ordnance Department guns, and this resulted in the 3-inch field gun, Model of 1902. Up to the time of the World War about 600 of these guns had been constructed. Although built for somewhat lower muzzle velocity than the French 75, it is believed that during the time it was the standard field gun of our service it was not inferior to those in use by any other country.

In the decade before the World War there was great activity in the design of guns and howitzers of 3, 3.8, 4.7 and 6-inch caliber and a series of such weapons was adopted for the service previous to the World War. Not any great numbers other than of the 3 and 4.7-inch were built as the conditions of the World War required the procurement of weapons in France.

IN the period preceding the World War the organization of the Ordnance Department did not differ in principle from that established long before the Civil War, nor did the relation of the Ordnance Department to other branches of the Army differ greatly from that in existence at a much earlier period. The Chief of Ordnance had divided the Ordnance Office into divisions consisting of a gun, gun carriage, small arms, finance, and property divisions. In so far as activity in the Ordnance Office is concerned, the gun carriage division, for instance, looked after the design, development, procurement, construction and maintenance in the field of gun carriages; and similarly for other divisions. The actual work of maintenance in the field was effected by a division of the country into several armament districts with an armament officer in charge of maintenance in each. An arsenal was assigned as the headquarters of each armament district and the armament officer of that district, who was usually stationed at the arsenal, was charged with all repairs and maintenance of armament and with carrying out such modification orders as he received from the Ordnance Office.

I cannot incorporate in this paper much of a description of the activities of the Ordnance Department during the World War. I shall merely indicate what changes in organization of the Ordnance Department as a whole took place during that conflict. The Department went into the war with the organization which I have indicated. There was provision in the war plans of the Ordnance Department at that time for the establishment of depots as required by any emergency. Such depots were established at the ports of embarkation in the early days of the war. The tremendous amount of material which had to be gotten out in a hurry to equip the Army as it was being raised and to provide for the future led to a tremendous expansion of the personnel of the Ordnance Department. Ordnance personnel required for duty with troops was not an inconsiderable item. The maximum figures reached during the World War of personnel engaged in Ordnance activities were: officers, 5,954; enlisted men, 62,725; civilians, 88,150.

The great activity which early developed of moving stores from one place to another and issuing them to organizations required the establishment of a property division on a much larger scale than that which existed with duties which were more active and dynamic than those of the peace-time property division. This division was therefore reorganized and became the supply division. It had charge of all activities connected with the supply of troops in the United States and the movement of ordnance to France.

THE duplication of functions in divisions or sections which performed the same function on different classes of material led to difficulty in dealing with manufacturers and to some competition between sections of the Ordnance Office in obtaining like items for different classes of finished products. In an attempt to overcome this difficulty, the Ordnance Office was organized early in 1918 on a functional basis, the functions being estimates and requirements, engineering, procurement, production, inspection, and supply, and a division was organized to accomplish each of these functions. It is very remarkable that such a change in organization could be effected and put into running order within such a short period of time. By the fall of 1918 the new system was running as well as it could. Its shortcomings were early recognized. The individual item, which possibly received too great attention in the previous organization, was now lost sight of and the division performing one function had difficulty in knowing when to begin its part of the work. The single item, instead of being followed through by a single organization, had to be helped through on its way toward the troops who were to use it by each of these six divisions, and the relative importance of various items was frequently lost sight of in this process.

Immediately after the Armistice and while in process of demobilization a change back to approximately the old organization was effected. There were retained, however, some of the features of the war-time organization. The Office of the Chief of Ordnance now consisted of an administration division, a technical staff, a manufacturing service and a field service. The functions of each of these are well known to readers of this Journal and need not be gone into here. The organization as then laid down is now in existence.

Developments of Ordnance matériel since the World War have been more active than at any period in the history of the United States. The nature of the war had given our officers an opportunity to see what was in use in all the European countries and had shown them at first hand the use of all classes of weapons in the field. Many of the ideas thus obtained were reflected in post-war designs.

But this is history with which most of the readers of this article are familiar from personal knowledge or other sources, and I shall not go into it in this paper. As I wrote in concluding the second article of this series of brief discussions, I have attempted to recount only some of the milestones on the journey of American Ordnance. I take it that all readers share the hope that some day some one will give us a detailed history of this monumental record. (*Conclusion.*)

A Plea for Munitions Quality

Our Commercial Testing Agencies Should be Utilized in War

By Preston S. Millar*

THE national emergency precipitated by the World War found the country in a condition of unpreparedness for which it paid dearly. That experience obviously taught the lesson of the value and economy of preparedness and the Army Ordnance Association has done well to endeavor to inculcate that lesson for the benefit of the country.

Among many ramifications of preparedness, all of which should receive attention and should be coördinated, the matter of insuring the quality and reliability of supplies and equipment will probably be regarded as of considerable importance. In this particular, however, little appears to have been accomplished in profiting by the lessons of the last war. During that war early unofficial advice from governmental sources was to the effect that technicians who were specialists in testing and inspection could often be of greater service to the country in making their services available through ordinary business channels than through enlisting, and assurance, similarly unofficial, was given that there would be much need for the services of such men. Later it developed that there was some objection against having service of this nature rendered by men not in uniform. Whether or not there was a regulation to that effect the present writer is unaware. The upshot of the matter was that highly technical inspections were often made by men of limited competency and experience, while men of adequate competency, feeling the patriotic urge to be of assistance, were not utilized. Electrical Testing Laboratories, with which the writer is associated, the leading public testing laboratory in the electrical field, enjoying the confidence of the electrical industry, and with facilities, organization and personnel which equip it for work not only in the electrical but also in the mechanical and chemical fields, was utilized hardly at all. This testing organization could have been expanded and its services could have been very useful to the Government with no risk of attempted profiteering and with assurance of competency and an earnest desire to serve.

Is it not a reasonable proposition that the several leading industrial laboratories of the country in their respective fields should be brought into preparedness planning to the end that, when and if a national emergency arises, provision will have been made for them to fit into their proper niches, assuring a smoother working of the supply problem than otherwise can be expected?

THE plans for industrial preparedness that have been developed in recent years, under the authority of the National Defense Act, have been concerned chiefly, and very properly, with plans for the production of war matériel. Promotion of the availability of blueprints and schedules, building a familiarity in industry with procedures and requirements, and trial orders placed for small quantities from time to time for the purpose of insuring readiness in emergency, are probably among the principal elements of our industrial preparedness as it has so far been developed. Much emphasis has been placed upon readiness for M-day. It is the purpose of this article to ask the question, "What provisions should be made for application in the hectic and strenuous days following M-day to insure that the matériel delivered for war purposes shall continue to be as nearly as practicable just what is wanted?" It is one thing to place a set of blueprints in a factory, to see the machinery lined up for production and to see the first samples turned out. It is quite another thing to be able to rely upon the identity of performance, workmanship and suitability of products turned out on subsequent contracts months after the initial production. The same thing applies to purchases of matériel not necessarily fabricated especially for war purposes. Specifications presumably are available and contracts will call for conformity with those specifications. What steps are contemplated to insure that goods delivered actually do so conform?

IT is relatively easy to establish facilities for checking dimensional precision. Inspectors in the factories and at the receiving depot, properly equipped with gages and scales, can perform services of this kind. Simple tests and checks for functional precision and suitability are possible through similar arrangements. Even in such comparatively simple operations, however, it is possible greatly to improve the service by placing behind the individual inspector an organization trained and equipped, with a background of just this kind of service through many years.

In addition to specialized war material, large procurement of supplies of a non-special or only slightly special character is involved. When it comes to determining the satisfactory performance in service of such items as insulated wire, dry cells, gas masks and auxiliaries, telephone equipment, electric lighting equipment, tentage, uniforms and motor vehicles, it frequently becomes necessary to make tests and determinations involving the use of technical equipment and a high order of technical proficiency on the part of the personnel engaged. For illustration, the United States Government in peace time purchases large quantities of dry cells, using for that purpose Master Specification No. WB 101-1931, prepared for governmental use by the Federal Specification Board. This specification calls for tests intended to provide a measure of probable life in service, one of the features being an intermittent discharge test which requires a period of several weeks. To perform such tests economically suggests the use of automatic equipment. Where else could tests of this kind be performed more readily, more cheaply, and with greater satisfaction to all concerned, than in a laboratory especially organized for such work?

When the country needs steel for war purposes, it goes to the steel mills accustomed to producing it. Orders for meat are placed with the meat-packers who know how to secure and deliver it. Why then should not commercial testing laboratories and inspection agencies, organized and operated

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for that purpose, be utilized in checking and inspecting the satisfactoriness of commodities purchased, to insure conformity with specified requirements? There are a number of such organizations in various parts of the country, usually with special proficiency in individual fields in each instance. Thus, one may operate chiefly within the textile field, another with construction materials, another in the electrical field, and so on. They are distinctly component parts of our modern American industry just as much as are the large factories that actually produce the material of war. It would seem that their services would be invaluable in the event of an emergency. Yet, to the best of the writer's knowledge, there has never been an effort made to organize these agencies so readily available, for service to the country in war time.

SUCH testing and inspection work as has been done in the past during war time has been done for the most part under the supervision of commissioned officers of the branches interested, sometimes with the assistance of enlisted or civilian personnel. It is no derogation of these officers' services to state that in many instances they could not have operated to the best advantage because of lack of previous training and experience in such work. It does not by any means follow, because a man is proficient in the design or manufacture of a device that he is the most capable inspector. There seems to be such a thing as an inspector's "sixth sense," just as a good newspaper reporter is said to have a "nose for news." Organizations built up through the years to perform such services necessarily develop technical staffs characterized by the inclusion of men especially competent in this work.

It ought to be obvious, I believe, that an organized inspection service with a central headquarters and a well equipped and manned laboratory, is capable of rendering service more valuable in the public interest than a number of individuals, each of whom may be technically competent, but who are not coördinated and supported as elements in a technical organization functioning in line with their specific requirements. Inspection conducted by an organization of the latter class is featured by a consulting staff with electrical, chemical and mechanical experts and by the resources of a well-equipped laboratory. For these reasons it excels in competency.

Familiarity with specifications and standards in pertinent fields is another asset which such inspection enjoys. Participation in developing standards and specifications for commercial purposes has brought experience which might very well be utilized as a part of the preparedness program in the preparation of specifications for at least non-special commodities and products for Government purposes. Interpretation and application of specifications will thereby be rendered more competent.

Another advantage to be secured from the use of experienced organizations is the ability of the inspection agency to be of constructive assistance to the purchaser and to the manufacturer. This matter touches upon the elements of the relation of the inspector to the other two parties in the transaction. Nominally employed by the purchaser to insure conformity with specifications, the inspection agency is nevertheless in a position to render additional service of great value to both purchaser and the supplier. He might be doing his full duty if he merely rejected unsatisfactory products. It is so much more constructive, however, if he notifies the supplier as soon as a trend is observed contrary to the intention of specifications, thereby giving the supplier an opportunity for correction. He may be in a position further to assist the supplier in avoiding undue waste by pointing out the nature and probable causes of deficiencies or irregularities to which objection is made. In some cases he is rendering a service to both parties if he recommends to the purchasing interest certain modifications of specifications to meet manufacturing requirements, possibly lowering costs and benefiting all concerned. A good illustration of this kind of constructive service is to be found in the field of incandescent lamps.

The Government is a large purchaser and has developed specifications for their use. Manufacturers and utilities have taken great interest in the matter and have assisted in drafting the specifications. The point of the story is found in the services of a testing laboratory which for years has operated under sponsorship of the purchasing electric utilities, coöperating with the manufacturers' own engineers, but at the same time guarding the interests of the purchasers, always to the end that a better product should be available at reasonable cost. This makes a story of accomplishment through the kind of specialized inspection and testing service I am discussing that justifies separate treatment at another time.

IN other words, a competent inspector is something like a good staff officer; he functions by authority of higher command but he has wide powers of discretion that may be constructively employed and the intelligent inspector backed by a testing organization will utilize such powers to the fullest upon every possible occasion where the purpose of his work can be thereby promoted. It would be expecting the impossible to rely upon the commissioned personnel of any branch of the service for inspectors of this type. Qualifications of this kind are developed only through years of experience and men of this type are most readily found in organizations that have need for their services year after year, that is to say, in the commercial testing laboratories and inspecting agencies. For example, at Electrical Testing Laboratories there are a number of veteran and reserve officers of the Army and Navy upon its technical staff quite familiar with much of the service point of view regarding technical requirements. I speak of this organization merely because it is the one with which I am most familiar. No doubt other laboratories and inspection agencies are similarly manned. In fact, it would be possible to develop an argument based upon the intent of the National Defense Act and designed to show that reliance upon the reserve component of the Army and the commercial organizations in which reserve officers function in peace time should be developed for use in procurement along the lines suggested above. We have passed the time when we can expect to keep within the regular military establishment the specialized personnel required for supervising procurement services in an emergency. We have gone a long way in developing the machinery for our industrial preparedness, so far as production is concerned. I suspect, however, that we have not yet given adequate attention to inspection and testing services which commercial experience has shown to be such an important auxiliary to production arrangements.

(EDITOR'S NOTE: *A discussion of this article by an officer familiar with industrial procurement policies will be published in the November-December issue of this Journal.*)

The Weight of Gun Carriages

Effect of Long Range on Artillery Design

By E. C. Goebert*

THE progress of development of artillery has been extremely interesting from the inception of gun powder down to the present day. Beginning with the crude muzzle-loading cannon, man has applied his efforts toward constantly improving the ballistics and mechanical efficiency of the gun and carriage.

Consider the fundamental purpose of war. As far back as history will take us, and no doubt into the days of prehistoric men, war has been a physical conflict between men for the purpose of conquest, existence, liberty or adjustment of existing conditions believed to be detrimental to society or the civilization of the time. Success in winning a war requires superiority in the ability to destroy or disable the man power and material property of an adversary. In the days of wandering tribes the destruction of property meant little and consequently the destruction of man power was the deciding factor in winning wars. The conflict in those days was a hand-to-hand engagement with the law of the survival of the fittest deciding the outcome.

With the forward progress of civilization man began to accumulate material wealth. He came out of the caves and created places of abode, settling down on the land which he cleared and cultivated, formed communities, built towns and cities which in many instances have developed into centers of almost limitless property value. The destruction of material wealth because of its enormous value was thought by some military authorities to be an all important deciding factor in winning a war. However, the experiences of the World War made this hypothesis highly problematical. To illustrate: the Germans battered the eastern part of France into a "no man's land" and lost the war. The Allies on the other hand slowly and deliberately exerted their efforts to reduce the man power and morale of the Germans and won the war.

RECOGNIZING that property destruction has some proportional value in winning a war, its effect has been imposed upon the development of artillery and along with the harassing effect of such fire is no doubt the reason for the development of weapons of long range. The artillery of early history had short range and was fired against visible targets. As the weapons were improved the range was gradually increased and in the World War the principal weapons, the Allies' 75-mm. gun and the Germans' 77-mm. gun, had ranges between 9,000 and 10,000 yards. With the increase of range except under most favorable conditions, the direct observation of the burst of the projectile is practically impossible so that fire must be conducted against invisible targets by the use of maps and highly developed fire-control instruments.

The value of long range in direct fire in the destruction of property is no doubt great but, on the other hand, its effect upon the all important destruction of man power is exceedingly low. It has been estimated that in the World War it took an average of 800 rounds of artillery ammunition to produce one casualty! On the basis of the 75-mm. gun allowing that the average life of the gun tube under the condition of fire experienced in the World War was approximately 5,000 rounds, eight casualties resulted for every gun tube worn out. This would tend to indicate that even with the ranges used in the World War the results obtained in man power destruction were not of a high order.

Since the World War a concerted effort has been made to further increase the range in practically all weapons and as a result the designers, by taking advantage of the development of better grades of material and new processes of manufacture have produced weapons which, when considered merely as machines, are developed to a very high mechanical efficiency.

HAVING accomplished this engineering feat the question arises have we not materially reduced the overall efficiency of the weapon as an instrument of destruction of enemy man power especially if in future wars the artillery takes advantage of this range to remain further behind the front line of an engagement?

Further let us consider with interest the advantages gained and the disadvantages resulting by this increase of range. Listing the advantages:

First, the increased range has made possible a deeper penetration of the enemy lines with artillery fire.

Second, the selection of positions in which to emplace the carriages has been greatly enlarged.

Third, for the same depth of penetration the path of ammunition supply may under certain conditions be shortened by a maximum of the difference between the larger range and the World War range.

The disadvantages may be listed as follows:

First, the weight of the units has been increased and correspondingly the mobility decreased.

Second, observation when taking advantage of the increased range has been made more difficult with a resulting probable increase of ammunition expenditure to accomplish a mission.

Third, the muzzle velocity of the weapons has been increased and, therefore, the life of the gun tube in rounds reduced.

Fourth, the powder charge necessary for the long range has been increased and, therefore, the cost of each round fired increased.

Fifth, the development of longer and more costly systems of communication from observation point to gun position to make possible proper control of fire at the long range has resulted.

Sixth, the effectiveness of the gun shell at short and intermediate ranges has been lessened by decreasing the angle of fall at these ranges to overcome which two charges, a normal and a super, have been introduced; thus adding to the always important matter: the complications of ammunition supply.

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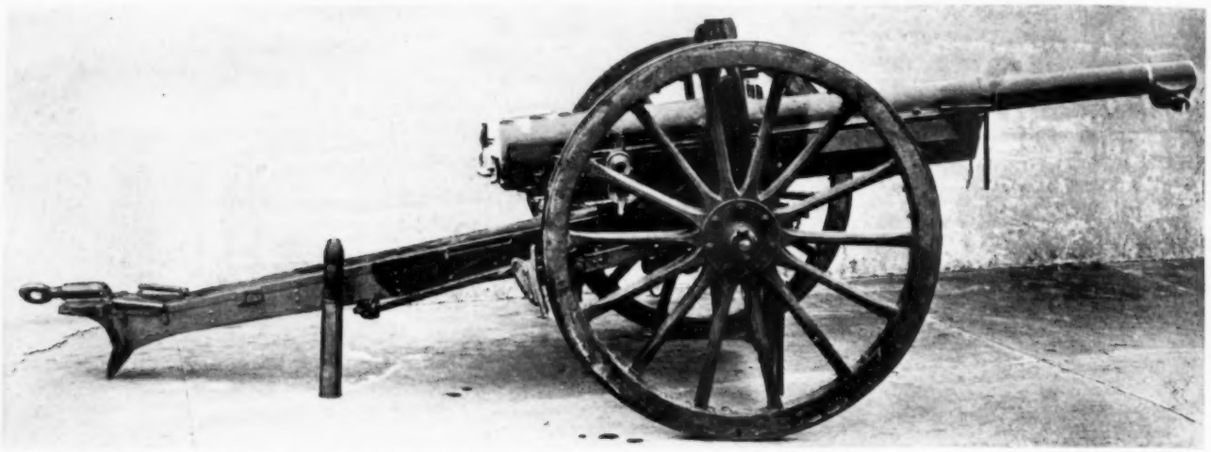
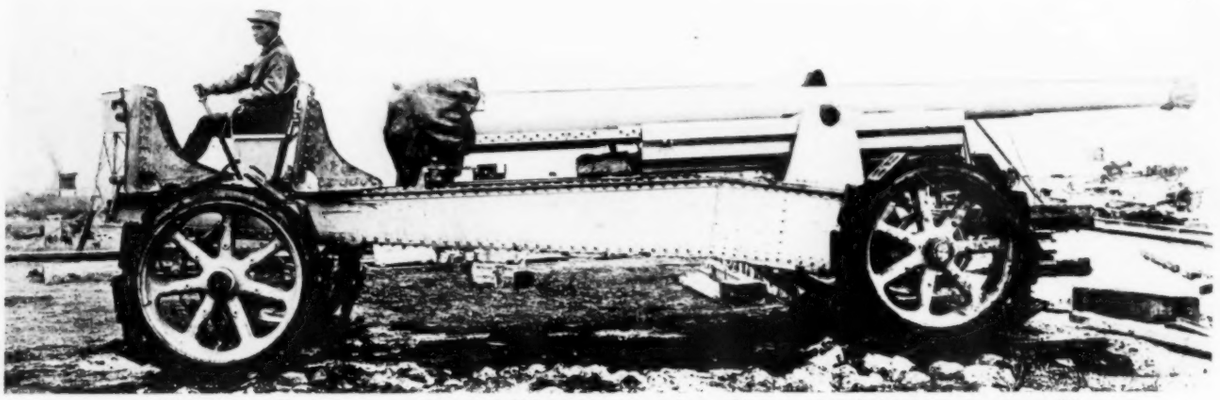


The Old: The 75-mm. Gun (French), Mod. 1897, Weight: 2,657 Lbs.; Maximum Range 6,930 Yds.



The Old: The 155-mm. G. P. F. Weight: 29,400 Lbs.; Range at 35° Elevation 17,400 Yds.

Weighing the disadvantages against the advantages one cannot help but wonder: has constructive progress really been made in this intense drive for longer ranges? Has not the mechanical efficiency of our weapons been increased at the sacrifice of the real efficiency? Would it not have been better for the ordnance engineer to have used the higher grades of material and improved methods of manufacture to produce a real balanced design based upon the ranges of the World War?

The comparative table (opposite) of the principal characteristics of the 75-mm. gun and carriage M1897 M1 and the 75-mm. howitzer and carriage T1 (of recent date) gives much food for thought.

In addition to the advantages shown by the tabulation, the 75-mm. howitzer carriage T1 design includes features not found in the 75-mm. gun carriage M1897 M1; such as, commercial disk wheels carrying pneumatic tires and mounted on hubs containing antifriction bearings and spring suspension. These added features make possible road and cross-country travel at speeds way beyond the old horse-drawn units with less resultant injury to the vital parts of the carriage from shocks encountered in the travel.

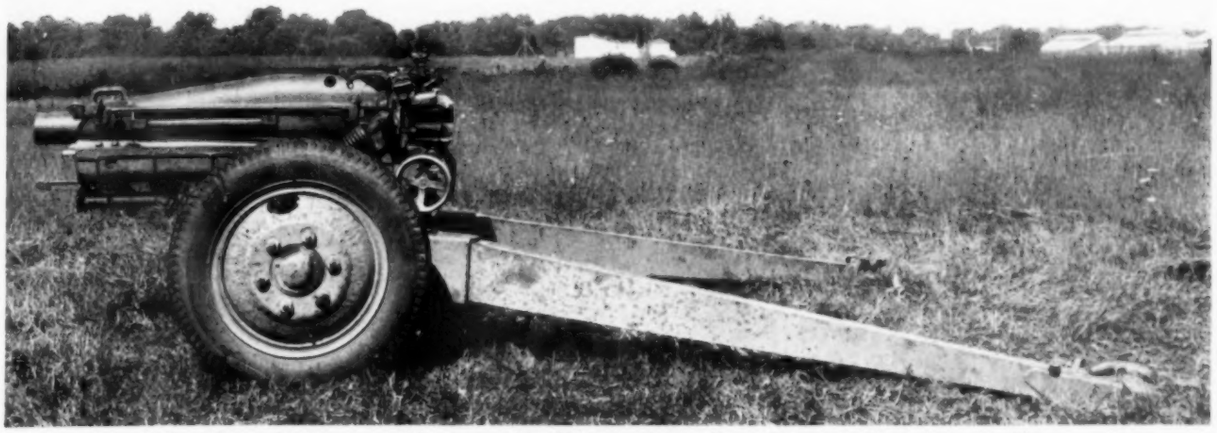
The 155-mm. gun illustrates another example of what could be accomplished. The G. P. F. weighed in traveling position 29,400 lbs. and at 35° elevation had a range of 17,400 yards. After the World War a 155-mm. gun tube capable of producing a 26,000 yards range was designed and manufactured. This gun has been mounted on a modern carriage at a total weight in traveling position of approximately 30,500 pounds.

On the basis of comparison with the 75-mm. units it would in all probability be possible to produce a unit with the same range as the G. P. F.; namely, 17,400 yards within a weight limit of from 21,000 to 22,000 pounds including all modern improvements found in the 155-mm. gun 8-inch howitzer carriage T2 with a saving in weight of between 7,000 and 8,000 pounds.

Table

	75-mm. Gun & Carriage M1897 M1	75-mm. Howitzer & Carriage, T1
Weight of projectile (shell)	12.75	15
Muzzle velocity (ft. per sec.)	1,850 Super	1250
Maximum range (yds.)	6,930	9200
Maximum range with trail buried (yds.)	9,200	
Maximum elevation (degrees)	19	45
Elevation with trail buried (degrees)	45	
Total traverse (degrees)	6	45
Weight of unit (lbs.)	2,657	1880
Overall length, traveling position (inches)	173	156
Overall length firing position	173	125
Overall height in traveling position at zero elevation (inches)	53	42
Overall height in firing position at zero elevation (inches)	55	36
Overall width (inches)	70	67.5

Assuming for the sake of discussion that the long ranges in artillery weapons are obtainable only at an excessive sacri-



THE NEW: THE 75-MM. HOWITZER T1, WEIGHT: 1,880 LBS.; MAXIMUM RANGE: 9,200 YDS.

THE NEW: THE 155-MM. GUN CARRIAGE T2, WEIGHT: 30,500 LBS.; RANGE: 26,000 YDS.

fice of such elements as mobility, life of the gun tube and ease of observation of fire, the suitable types of weapons will be considered classified or grouped in the following range limits: 1st, 8,000 to 10,000 yds.; 2nd, 10,000 to 12,000 yds.; 3rd, 12,000 to 15,000 yds.; 4th, 15,000 to 20,000 yds.

In the 8,000-10,000 yard limits could be placed the 75-mm. howitzer with its 9,200 yard range. This weapon would be extremely mobile and produce the high-angle fire found to be most effective against personnel. It should, therefore, be the principal division weapon. No flat trajectory gun would be placed in this group since gun fire when absolutely necessary could be obtained from the gun selected for the 10,000 to 12,000 yard group.

For the 10,000-12,000 yard group there should be selected both a gun and a howitzer. In the interest of ammunition production and supply it would be advantageous to have both these weapons of the same caliber; however, since the missions of the two are entirely distinct and since, after all, the ultimate purpose is to secure the weapon most suitable for the mission it would seem advisable to place in this group a 75-mm. gun and a 105-mm. howitzer.

The shell for the 75-mm. gun could be identical with the 75-mm. howitzer shell and this gun could be used as the secondary division weapon. The 12,000 to 15,000 yard group could contain the 155-mm. howitzer and a gun of approximately 105-mm. caliber and in the fourth or 15,000 to 20,000 yard range could be fitted the 155-mm. gun and an 8-inch howitzer. These classifications seem to cover the needs.

To obtain ranges beyond 20,000 yards when necessary special Army weapons could be relied upon; such as, the 26,000 yard 155-mm. gun, 8-inch gun and the 9.2's.

CONSIDERING now the weapons selected above with respect to weight, the 75-mm. howitzer can be built to weigh 1,880 pounds in firing position. With a reasonable amount of traverse, say 60°, it is believed that an efficient modern 75-mm. gun carriage could be designed within the limits of 3,000 pounds bearing in mind that the range would not exceed 12,000 yards, a 105-mm. howitzer for about 3,400 pounds; a 105-mm. gun 4,500 pounds; a 155-mm. howitzer 10,000 pounds; the 155-mm. gun 22,000 pounds and the 8-inch howitzer for 29,500 pounds.

In conclusion it is desired to state that this article expresses, according to the personal views of the writer and not the official opinion of the Ordnance Department, the problem of artillery weapons from the viewpoint of the designer. There may be ample reason why the range limits expressed are not sufficient for the artilleryman's use and that the extreme ranges sought since the World War are absolutely essential. Should this be the case, however, with the persistent demands for increased features of carriages; such as wide traverse, high road speed, etc., the field artillery must adjust its demands to a point where increased weights will be acceptable, since the designers have exhausted every available resource to keep the weight to an absolute minimum and still obtain stability and wear life in gun carriages. The question is one of importance.

Tokyo Stages a Realistic Air Raid

FIREFIGHTERS AT WORK EXTINGUISHING FLAMES CAUSED BY BOMBS DURING AN AIR ATTACK.

SEARCHLIGHTS OF THE DEFENDING FORCES USED TO LOCATE THE AIR RAIDERS.

The Identification of Firearms

What the Expert Can Do in Criminal Cases and How He Does It

By J. S. Hatcher*

IT is, of course, necessary for the firearms identification expert to have a microscope, and in addition to the ordinary microscope which is used merely for looking at magnified objects, several special forms of this instrument are found to be indispensable in this work. One of these is the comparison microscope, as readers of this Journal know from illustrations formerly published in ARMY ORDNANCE. This consists, in reality, of two microscopes rather than one. The two microscopes, which are identical in construction and size, are placed side by side and the view from both microscopes is brought together into a single tube by means of prisms and is viewed through one eyepiece, thus two objects can be observed at the same time. One can be placed under the right-hand miscroscope and the other under the left-hand one and by proper adjustment they can be brought into such a position in the field of view that the two images come together so perfectly that only a single object is being observed, while in reality the user of the instrument is looking at half of one object and half of the other at the same time. This enables extremely close comparisons to be made of the type of rifling or the character of certain scratches or markings on the surface of a bullet or primer.

Then another attachment for the microscope is the filar micrometer. This is an eyepiece for the microscope fitted with a movable thread, or cross-hair, in the field of view. This cross-hair is moved by means of a graduated knob on the outside of the eyepiece which shows how far the cross-hair is moved. Such a microscope is commonly used in laboratories for the purpose of making precision measurements. Readings with it can be made down to the one-hundred-thousandth part of an inch. It derives its name from the Latin *filum* meaning a thread, which refers to the cross-hair stretched across the field of view. For use in measuring the angle of the rifling a protractor scale, reading in degrees of angle, is placed on the outside of the eyepiece so that the angle through which it is turned to place the thread parallel with the rifling on the bullet can be read. A revolving stage on the microscope with the edge graduated in degrees could also be used for this same purpose.

Of course, it is necessary to have cameras with which photographs of bullets and other exhibits can be made. For the examination of the inside of firearms to determine the condition of the bore or to view particular marks, it is useful to have a sort of periscope fitted with an electric light to illuminate the inside of the bore and a set of lenses to magnify the view. Such an instrument is called a boroscope. It is useful to have this fitted on a stand so that it can be slid along with a lengthwise motion into the bore and also can be turned through any angle necessary. Suitable indexes are fitted for reading the distance that the boroscope has been pushed in to the angle through which it has been turned. Such an instrument used by Colonel Goddard in his work is called a helixometer because with it, it is possible to measure the twist of the rifling inside the barrel very accurately.

PROBLEMS in firearms identification generally arise from the finding of either a bullet or cartridge case at the scene of the crime. Sometimes the suspected weapon is available, at other times there is no other information as to the weapon used except the knowledge that it must have fired the bullet

THE HELIXOMETER.

This instrument is for the examination of the inside of firearms to determine the condition of the bore or to view particular marks. This model is now available commercially.

or used the cartridge in question. Thus there are two general classes of problems. In the first class, the fatal bullet or the empty cartridge case is available and it is desired to know from examination of one or both what kind of gun was probably used in the crime. Frequently the information thus gained directs the further efforts of the investigators. In the second class of problems, the fatal bullet or the cartridge, or both, are on hand together with a suspected gun. The problem now becomes that of determining definitely whether the bullet or the cartridge in question was or was not used in the suspected weapon.

In considering the methods to be used in solving such cases, it is well to bear in mind the fact that when a gun is fired it leaves on both the bullet and the cartridge case certain marks which may be divided into three categories.

First, there are the class characteristics or marks which all guns of a given class will leave. For example, all rifled arms will leave grooves on the bullet. All Colt guns will leave left-hand rifling on the bullet. Most automatic pistols will leave extractor marks on the cartridge case.

The second category is what may be called individual characteristics. If a particular gun had a broken firing pin it would leave a certain mark on the primer that no other gun would leave; it is an individual characteristic of this particular gun and no other gun. In the same way, if a

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gun has been rifled with a broken rifling cutter, it will leave peculiar grooves on the bullet which would be made by no other guns. Individual characteristics of this kind do not determine the type of gun which was used, but the actual individual gun.

In addition, there is a third category of markings known as accidental characteristics. These are characteristics or marks left by some individual gun that occurred on that particular shot and may or may not be reproduced on other shots. If, for example, a grain of sand or shaving of steel happened to be in the barrel when a shot is fired, a mark might be left on that particular bullet but on the next shot the piece of steel or grain of sand might not be present and there would be no mark. In general these accidental marks are of little or no help in solving firearms cases.

THE most frequent situation confronting a firearms identification expert is to be given a fatal bullet which was recovered from the body of the victim with a request for information as to what kind of gun was used. In this case we are obviously concerned with class characteristics relating to caliber, rifling, etc. It is usually possible at once to say what caliber of gun was used, and it is also obviously quite easy to tell several different calibers and kinds of guns that the bullet did not come from, but even with full data such as is possessed by the Crime Detection Laboratory of Northwestern University, it is difficult to say with certainty the exact type of gun that was used.

The difficulty of the task often depends a great deal on the circumstances of the crime. The recovered bullet may be almost intact and in its original shape if it happened to penetrate flesh only, or it may be badly deformed if it happened to have struck bone or other hard substances. Moreover, it may be mutilated by rough handling with a surgeon's forceps. Nevertheless it is usually possible to tell a great deal from a recovered bullet if the proper instruments are on hand and the bullet is subjected to the proper kind of examination.

Naturally we are interested primarily in the caliber. We want to know whether or not the bullet came from a .32, a .38 or from some other caliber, and this can usually be determined very accurately by measuring the bullet diameter. Even though the bullet is smashed at the point, the base is usually intact and an accurate measurement of the diameter can generally be obtained. For this purpose the diameter across the lands should be measured using every pair of lands in succession and averaging all of them. Then the diameter across the grooves is measured. These data taken in conjunction with the weight (and it may be stated here that a bullet usually changes very little in weight even though it is badly deformed) will give a very strong clue as to the caliber of the gun. These diameter measurements are best made by means of the dial micrometer gage reading to ten-thousandths of an inch, mentioned above.

Having learned the caliber, which is fairly easy, we will then want to try, if possible, the very much more difficult task of determining just exactly what make and type of gun of this caliber was involved. We already have (a) the weight of the bullet, (b) the diameter of the gun; the other class characteristics necessary for a complete identification of the type of weapon used are (c) the direction of rifling, (d) pitch of rifling in turns per inch, (e) number of grooves, (f) width of lands, (g) width, and (h) depth of grooves.

With this information and the table of characteristics as collected by Mr. Waite and his assistants, it is usually possible either to say definitely just what make and type of weapon the bullet was fired from or at least to limit it to one or two makes, eliminating all of the hundreds of others.

The first thing to determine is the direction of the twist; that is, whether right-hand or left-hand. This information eliminates a great many guns at once for nearly all weapons made in America and in continental Europe are right-handed, while English guns are left-handed. There is, however, one great exception to this rule and that is that one large American firm, the Colt's Patent Fire Arms Manufacturing Company, now use a left-hand twist for all their revolvers and automatics, including the Army automatic pistol.

Having determined the direction of twist, a most important and most obvious piece of information which has strangely enough been overlooked in some previous well known cases, is the number of grooves. As noted before, most Colt guns have six grooves, left-hand, and nearly all Smith & Wesson guns have five grooves, right-hand, the Remington automatic has seven, the Savage automatic six, and the Iver Johnson five, etc.

IT is most necessary to determine accurately the pitch of rifling on the fatal bullet. This is very important for while it may happen that several manufacturers may have rifling that looks very much alike as to width, depth and direction of twist, it fortunately happens that in none of these guns is the pitch of rifling just the same. Hence the pitch in inches per turn is frequently the one vital piece of information on which we must rely to give us the definite make of gun involved.

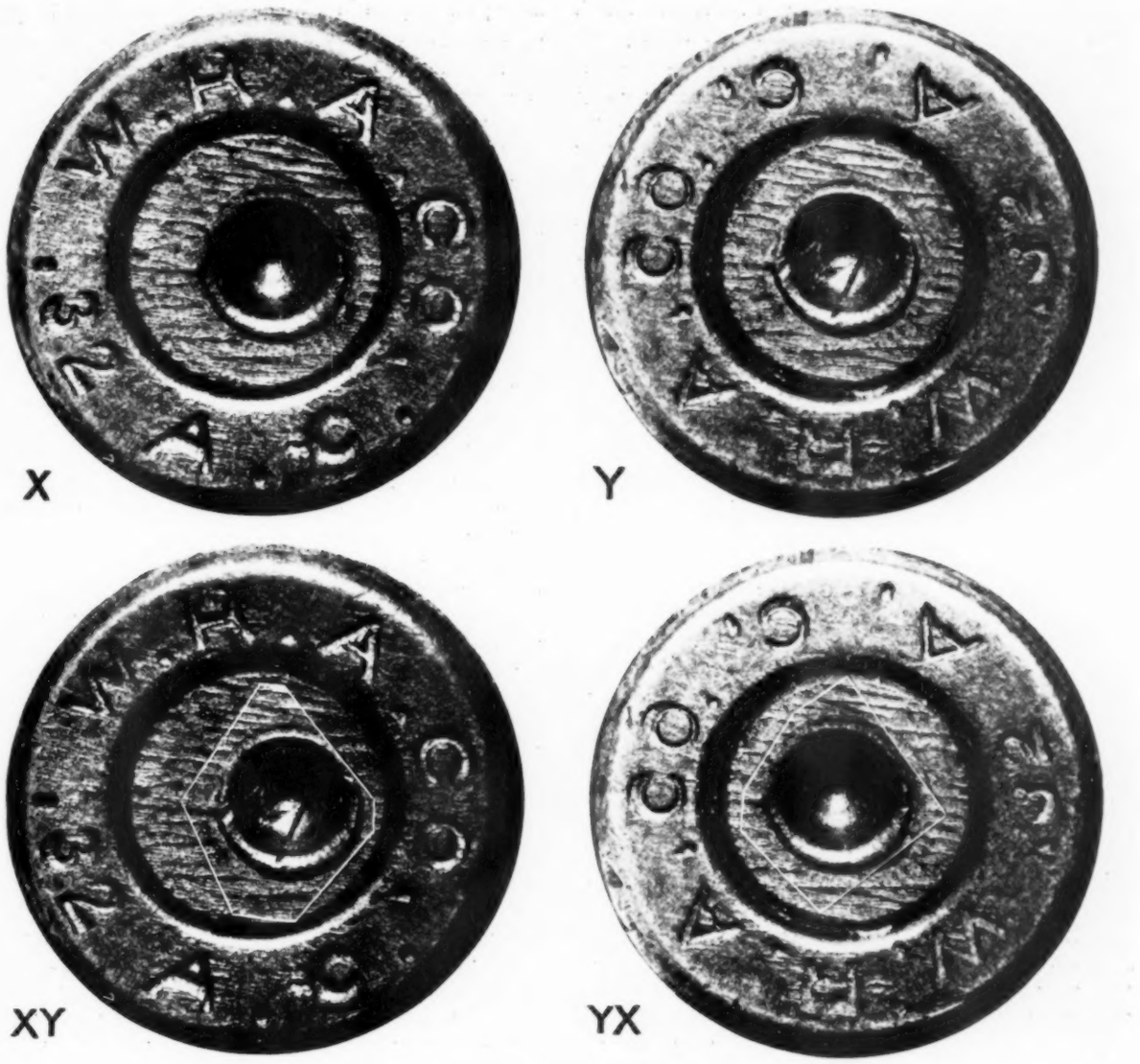
To measure the pitch of rifling the bullet is placed on the stage of a microscope with a filar micrometer hair-piece, previously described, which for this particular work is fitted with a protractor scale on the eyepiece. The cross-hair in the eyepiece is placed exactly parallel to one of the sides of the bullet and a reading is taken on the protractor. The eyepiece is then revolved until the cross-hair is parallel to the edge of the groove in the bullet and another reading is taken on the protractor, thus giving the angle that the rifling makes to the axis of the bullet. In the interest of the greatest possible accuracy this measurement is made for each of the grooves in turn and then they are all averaged up.

Knowing the diameter of the bullet and the angle that the rifling makes with the axis, it is quite a simple trigonometrical problem to calculate the twist in inches per turn. Calling the angle that the rifling makes with the axis Θ, the number of inches for one complete turn of the rifling will be π d tangent Θ where d is the diameter of the bullet.

The width of the lands and grooves as given by the markings on the bullet are also read by means of the filar micrometer microscope. When all of these readings have been tabulated it is only a matter of consulting the table of data to discover the type of weapon that was used.

It will be understood, of course, that so far we have been concerned only with identifying the type of gun and not with trying to find out whether or not a bullet came from a particular individual gun. This will come later when the knowledge already gained has enabled the authorities to seize the suspected weapon and submit it for examination.

It may frequently happen that in a crime of violence with



"FINGER PRINTS" IN THE HISTORIC SACCO-VANZETTI CASE.

X: Test shell in the Sacco-Vanzetti case; Y: Evidence shell in the same famous trial; XY: Duplicate print of test shell X with irregular polygonal area from evidence shell Y superimposed and pasted in place—note the matching of markings from the breech face; YX: Duplicate print of evidence shell Y with irregular polygonal area from test shell X superimposed and pasted in place—note the matching of markings from the breech face.

firearms that the bullet may not be recovered; it may pass entirely through the victim and be lost. This brings to our attention the fact that the automatic pistol has one great disadvantage as an instrument of unlawful violence, and that is the fact that each time a shot is fired the pistol throws out an empty shell. For this reason it is common in the case of homicide with an automatic pistol for the investigators to find one or more empty cartridges. Ordinarily when a revolver is used in a shooting no empty cartridges are found as the user of the gun would hardly be so foolish as to unload the cartridges on the ground to remain as evidence against him.

Like the recovered bullet we have discussed above, the empty cartridge case has a number of prominent class identification marks, the most obvious of which are the initials of the maker and the date stamped on the head of the case. Moreover, the type and caliber of the cartridge is usually readily recognized. Thus the investigator knows what caliber of gun was used and the make of the cartridges.

There are, however, a number of much more definite class characteristics which may indicate with certainty the particular type of gun that figured in the case. This is due to the fact that all automatic pistols put certain marks on cartridges which are extremely useful in identification. In the first place, most automatic pistols have extractors, and the extractor hook marks the cartridge. Also the shell is ejected by being drawn back violently against a plate of metal known as the ejector, which marks the head of the cartridge with a fixed relation to the position of the extractor mark, though in some pistols the firing pin acts as the ejector, and this mark will be absent.

Then in the automatic pistol the cartridges lie in a magazine and they are pushed up to the top of this magazine by a strong spring so that the top of the cartridge rests on the

bottom of the breech block. As the gun is fired the breech block recoils, dragging itself backward over the top cartridge. When the breech block has cleared the cartridge and is out of the way behind it, the cartridge rises to a higher position and is held from coming all the way out by the sharp steel lips of the magazine. As the breech block then goes forward to reload, it pushes against the top of the rim of the cartridge and forces the cartridge forward out of the magazine and into the chamber of the gun. In sliding forward under the magazine lips the cartridges are frequently scratched in a peculiar way. Then as the gun is fired and the cartridge is ejected, the rim is held by the extractor on the right-hand side while the ejector in effect kicks the left-hand side of the rim forward so that the cartridge pivots around the ejector and the mouth of the empty cartridge usually strikes on the side of the gun and gets a considerable dent.

Thus an ejected automatic pistol cartridge will usually have scratches on top from the breech block, scratches on one or both sides from the lips of the magazine, marks on the front of the rim due to the extractor hook, marks on the back of the head due to the ejector, and a dent on the mouth due to striking the side of the frame in ejection.

It is quite within the realm of possibility that all these marks may not only tell the type of gun that is used but in some cases they may form a pretty certain indication as to the particular individual gun in question. Thus in the *Scientific American* for January, 1927, Capt. E. C. Crossman states: "Characteristic and repeated scratches on the side of each cartridge tried in a seized gun, formed one link in the evidence which hanged seven Egyptians for the murder of Sir Lee Stack Pasha in Cairo, in 1924."

WHERE empty cartridges recovered at the scene of the crime are available and it is desired to know whether or not they came from a particular gun in the possession of a suspect, there is another important type of marking which furnishes far more definite identification when conditions are favorable than the marks described above.

These marks are what might very aptly be described as the "finger prints of the firing pin and breech block on the primer." In both automatic pistols and revolvers there are certain fine tool marks or scratches left on the breech face or the metal against which the cartridge presses when it is being fired. These marks are quite pronounced on metal surfaces that have been finished by a file as is commonly done on the breech face of the average automatic pistol or revolver. Examined under a microscope this surface appears to consist of a number of ridges or scratches, and when the cartridge is fired, the primer, being of copper or brass which is much softer than the steel of the breech face, will take the impression of these fine ridges.

Moreover, the point of the firing pin will have small ridges, and no two breech faces or firing pin points will be exactly alike. If several cartridges of the same make and time of manufacture as the sample cartridge are fired in the suspected gun and then photographed, it will be seen that certain identical lines and striations will be visible in each of the sample cases fired in that gun. If these same lines and striations are found in the cartridge case picked up at the scene of the crime, it is certain that it was fired in that gun.

In making identification in this way it is common to make large photographs of the heads of all the cartridges in question. If a photograph of the fatal cartridge case is cut across at right angles to the ridges left on the surface of the primer by its contact with the breech face, this cut photograph can be laid on photographs of the cartridge cases fired in the gun. If this cut photograph can be matched to one of the photographs in such a way that all the little lines and striations on the cut-out square blend with those on the large photograph, it shows conclusively that the prints were made by the same breech face or the same firing pin. Then again, the firing pin hole is rarely ever exactly in the center, hence the firing pin depression will usually be displaced a little from the center with a fixed relation to the ejector and extractor marks. This fact may aid greatly in guiding the investigators.

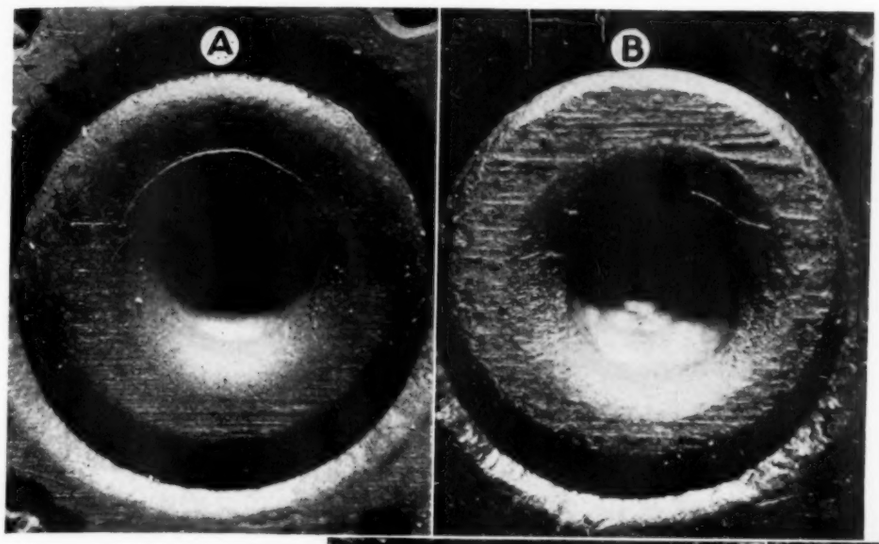
IT frequently occurs that a fatal bullet is recovered and it is desired to say whether or not this bullet was fired by a weapon found on a suspect. With modern methods it is usually possible to give a definite answer to this question and it should be noted here that it is just as important to be able to say that a bullet did not come from a given gun as to say that it did. The science of firearms identification is a most important asset to the innocent suspect for it gives him an absolutely infallible method of proving his innocence.

In a case of this kind the first thing to do is to determine whether or not the bullet came from the same class of weapon; that is, whether or not it contains the class markings of the gun in question. Obviously if the bullet is of a larger caliber than the gun, or if it has a different number of lands and grooves in it from the gun, or if the pitch of rifling is in a different direction, it did not come from that gun. On the other hand, if all "class" marks are the same diameter, pitch of rifling, direction of rifling, number of grooves, width of lands and width of grooves, the presumption is strong that the bullet did come from a gun of that particular type. This does not, however, prove in any way that it came from that particular gun as there are hundreds or even thousands of guns of each type manufactured.

Fortunately, however, each and every barrel has its own "finger prints" which it leaves on a bullet and identification by these marks is just as certain as identification of a criminal by his finger prints.

A rifle or revolver barrel is made fom a solid steel forging. The first step is to drill a hole all the way through from one end to the other. The next step is to ream this hole very carefully to exactly the correct bore diameter. This reaming leaves circular marks round and round the barrel, caused in part by irregularities of the cutting edge of the reamer and partly by little chips of steel that get caught by the reamer and drag around with it. A finished, reamed bore before rifling looks smooth and glassy to the naked eye but when examined by a high-powered microscope these marks show up in very pronounced fashion.

After the reaming has been finished, the next step is to put in the rifling. There is a rod that fits the inside of the bore and this rod has in one point of its circumference a small blade that scrapes away a part of the metal as the rod is drawn through the barrel. In order to give a twist to the rifling the rod is rotated at the same time it is drawn through. The amount of metal taken off by this little cutter as it goes through is small (about twenty-thousandths of an inch in the Springfield rifle which has grooves four-

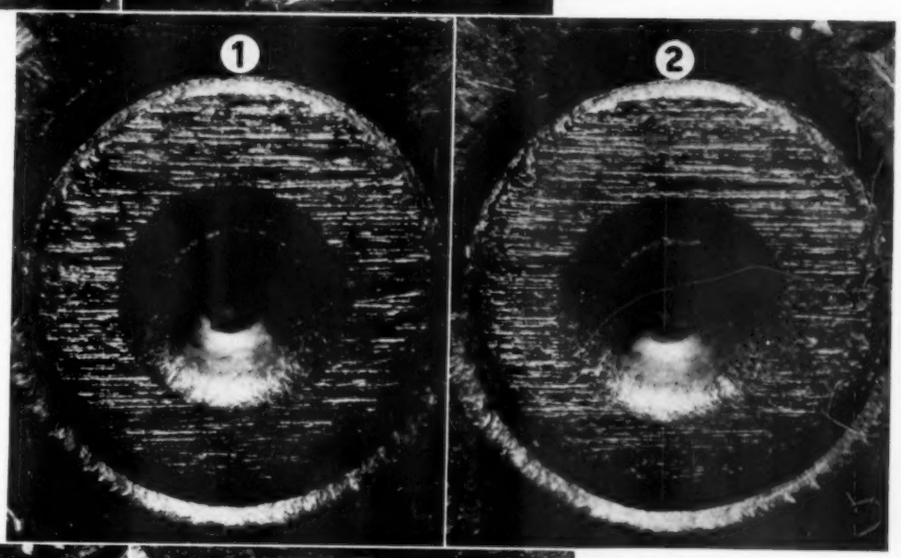


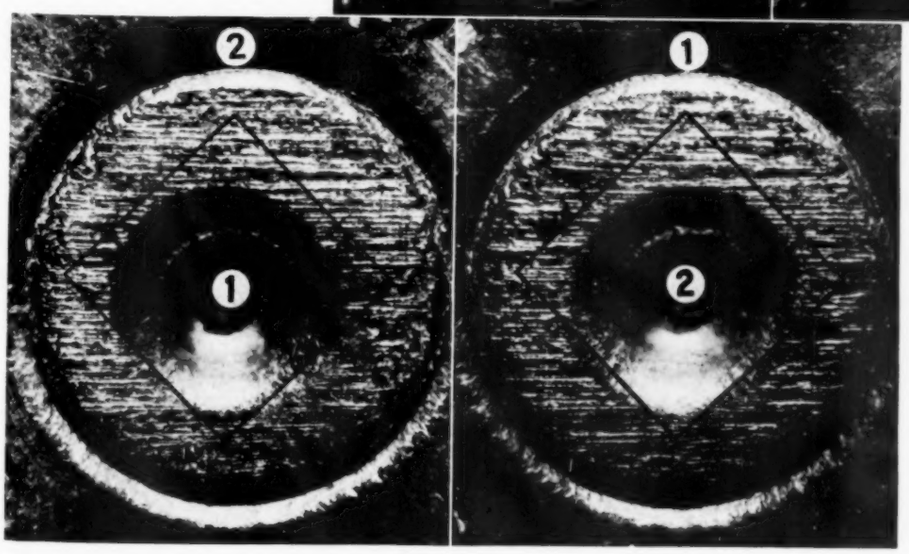
NO TWO BREECH FACES OF FIREARMS LEAVE THE SAME IMPRESSIONS.

At left: Prints A and B illustrate the firing pin imprints and breech face markings on two shells fired in *different* arms of the same make and model. The shells illustrated were fired in Caliber .38 Army Special revolvers. Note the marked *unlikeness* of the markings.

AS A COROLLARY, THE BREECH FACE MARKINGS OF ANY ONE FIREARM ARE CONSTANT.

At right: Illustrations Nos. 1 and 2 are photographs of primers of two shells fired in the same arm (Smith and Wesson Cal. 455). Note the similarity of the firing pin imprint and the marks from the breech face.



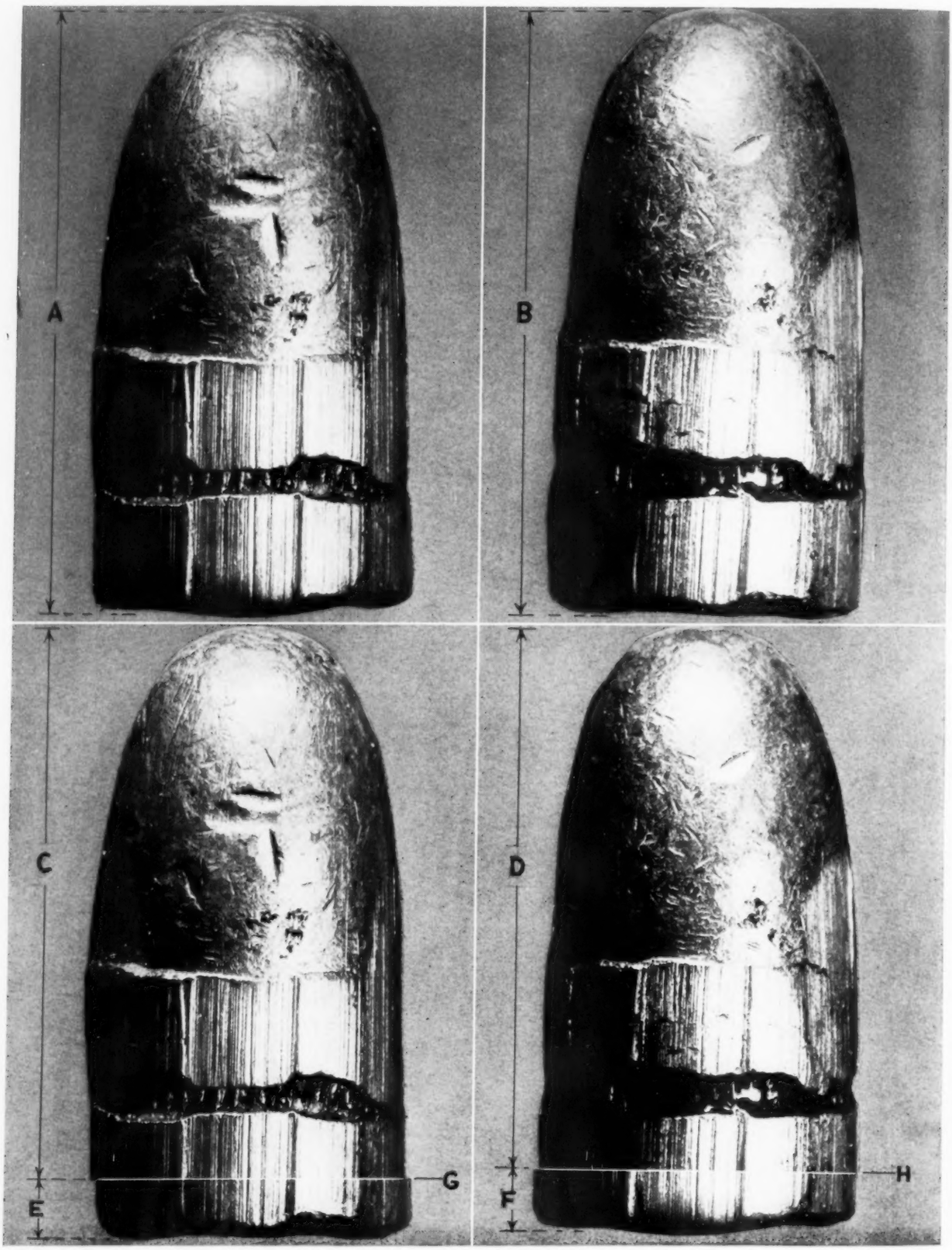


HERE THE TELL-TALE MARKS ARE MATCHED.

At left: In these illustrations square No. 1 has been cut from primer No. 1 (above) and transposed to the print of primer No. 2 (above) and vice versa. After transposition the whole composite picture was rephotographed. Note how the breech face markings in the composite photographs flow uninterruptedly across the dividing lines of the squares showing that the same markings exist on both primers.

thousandths of an inch deep and which requires eighty strokes to make each groove).

As the cutters are pulled through they carry away chips of the hard steel which forms the barrel and it is only natural that the surface or edge of the cutter should become abraded or roughened and have little pieces broken out of it. Thus a cutter is never the same at the end of a stroke as it is at the beginning, and it is never the same for one groove as it was for the last, and it is nowhere near the same for one barrel as it was for any other barrel. No matter



EVERY FIREARM LEAVES ITS OWN FINGER-PRINTS ON A BULLET.

A is a photograph of a fatal bullet; B is a photograph of the test bullet; CE is a composite photograph in which C is a duplicate print of fatal bullet A on which portion E, a duplicate print of the lower part of test bullet B, is superimposed; DF is a composite photograph in which F is a duplicate print of test bullet B on which portion D, a duplicate print of the upper part of fatal bullet A is superimposed (Thus, E + D = B). Note the matching of the fine striations across junction lines G and H.

how much this cutter is honed or brought to a fine, smooth appearing edge, it will have little chips and pieces broken out of it before it gets through even a single groove. Thus the grooves in a rifle barrel may appear smooth to the unaided eye but when examined with a powerful microscope the bottom of each groove will be seen to consist of a series of ridges and furrows running along parallel to the direction of the rifling.

Now when the bullet is fired through one of these barrels, the pressure of twelve to fourteen thousand pounds causes it to fill the grooves completely and take the impression of every slight irregularity. Thus when a fired bullet is examined under a microscope, it is found to be covered with a series of fine lines or striations parallel to the direction of the rifling and the striations or scratches in each groove of the bullet will be entirely different from those of any other groove.

If several bullets are fired from one gun it will be seen that small scratches or striations will be found on each of these bullets. In examining a fatal bullet to determine whether or not it came from a given gun, several test bullets of the same kind of ammunition, and as nearly as possible the same date of manufacture, are fired from the suspected gun into cotton waste and then recovered for examination. It may be stated here that a box full of loose cotton waste thirty-six inches deep will stop any pistol bullet, and the proper way to recover bullets is to place the muzzle of the gun within a few inches of this cotton and fire straight down into it. By digging into the cotton waste the bullets can be recovered entirely uninjured and all the marks intact.

THE examination of the fatal bullet against the test bullets is now made with a comparison microscope. This is really two separate microscopes with a single eyepiece. The fatal bullet is placed under one microscope and the test bullet under the other, and then the two images are brought together by means of a prism arrangement so that they can both be viewed at the same time. In this comparison microscope the field of view is split into two parts, half of which is the right-hand bullet under the right-hand microscope tube and the other half of which is the left-hand bullet under the left-hand microscope tube. One of the bullets is held stationary and the other is turned until a groove on one comes in line with the groove on the other. Then the surfaces are carefully compared to see if the lines and striations match up and blend continuously from one bullet into the other. If they do not the bullet is turned until the next groove is in line, and this process is continued until all the grooves on one bullet have been matched against all the grooves on the other. If the bullets both came from the same gun there will be one point in this process where the pattern of lines will blend from one bullet into the other, the same as if it were a single bullet under view.

While it is quite possible for the investigator to determine in this way to his own satisfaction whether or not the two bullets came from the same gun, this does not show the jury. To do this the fatal bullet is mounted on a spindle and the comparison bullet is mounted on another spindle connected to the first one by a gear train so that they can both be rotated together. The two bullets are matched up carefully so that the corresponding groove of each of the bullets is up. Then an enlarged photograph is made of each bullet, a cross-light with a special lamp being used to bring out the pattern of the cuts and scratches.

The bullets on the spindles matched together are then rotated through one-twelfth of a circle and another picture is taken, and so on around the circumference. Each picture shows the same relative portion of each bullet and each part will show the same markings if they are all from the same gun.

A BOOK containing the twelve prints is introduced in evidence at the trial. In the back of the book are twelve loose prints corresponding with the twelve mounted ones. The jury is allowed to take this book into its deliberations. The twelve loose prints may be cut in half and the cut-off portion moved over and superimposed on the prints in the album. If the lines on the print of a test bullet, cut in half and moved over on the print of the fatal bullet, coincide, then it is convincing proof that both bullets came from the same gun.

With this system it is easier to match lead bullets than metal-jacketed ones as the lead takes the impression better. It is easier to match a fatal bullet that has not been marred than it is one that has been knocked out of shape or mangled with a surgeon's forceps. It is easier to match a bullet from a barrel that is in good condition than it is one that is rusted or pitted or which has stood a long time without cleaning before being fired. It is easier to match bullets from a gun that has been fired with smokeless powder cartridges than one that has been fired repeatedy with black powder until the powder fouling has caked in the bore and obliterated some of the markings. However, in spite of all these difficulties, it is remarkable that in a large percentage of cases it is possible to tell positively whether or not a fatal bullet came from the gun in question.

The government automatic pistol barrel is made from a rod of steel that is long enough to make two barrels. After these barrels are bored and rifled, the piece is cut in two in the middle and one end forms one barrel and the other end forms the other barrel. As both of these barrels were rifled at the same instant, it would appear to be impossible by the methods described above to learn whether or not a given bullet came from one barrel or from the other, as it would seem that having been rifled together each individual mark would be the same all the way through. However, an exhaustive test on this very point made at Springfield Armory by Colonel Goddard, showed that he was able, absolutely, to determine which barrel a bullet came from even when the barrels were made together in one piece as described.

In this test a rod of steel was rifled under the supervision of a government officer and then cut in two to form two barrels. This was repeated three times, making six barrels in all, or three pairs of what might be called twins. Then one bullet was fired from each of these barrels and marked secretly by the officer supervising the test, who then turned them over to Colonel Goddard.

It is hoped that the information given here has not only set forth the possibilities of firearms identification, but has also illustrated some of the difficulties as well of attempting to do this work without the requisite skill and equipment. The average firearms investigator is often in a position to give much valuable information but he should distinctly understand his limitations and not get beyond his depth.

(*Conclusion. Part I was published in the preceding number.*)

Ordnance District Operation in War

A Study of Organization and Essential Procedure

By Wayne W. Cowan*

IT has been said that war is always waged with equipment prepared for the preceding emergency. It is certain that equipment is constantly being bettered and new inventions made so that items of ordnance are rarely manufactured exactly according to previous methods. Detailed factory plans as developed by the ordnance districts are excellent but the combination of circumstances is seldom such that those plans can be adopted in their entirety. With this in mind it has seemed that a very desirable part of such plans would be at least a small group of Ordnance reserve officers forming a skeleton organization so trained in district functions and method of operation that, regardless of changes in matériel and plan the district headquarters could be organized promptly in case of emergency and function smoothly without protracted training. To this end the officers of the New York Ordnance District have made, during the 1932-33 training season, a study of such a plan of operation.

This study is based upon a district headquarters organization devised by Lieut. Col. Charles G. Mettler, Ord. Dept., U. S. Army, former Executive Officer of the District, and an analysis of arsenal procedure and Ordnance Office General Order No. 3 by his assistant, Lieut. Waldemar S. Broberg, Ord. Dept., U. S. Army. A study of this nature must define an Ordnance district, establish its functions and set up such control as will assure the performance of these functions in accordance with existing laws and regulations.

THE Act of Congress approved June 3, 1916, better known as the National Defense Act, as amended by the Act of Congress approved June 4, 1920, specifically charges the Assistant Secretary of War with "supervision of the procurement of all military supplies and other business of the War Department pertaining thereto, and the assurance of adequate provision for the mobilization of material and industrial organizations essential to wartime needs."

The Chief of Ordnance, under the authority of this Act, and with the approval of the Assistant Secretary of War, has divided the continental United States into fourteen Ordnance Districts, each under a District Chief who is charged with the procurement, production, inspection of and payment for such articles of ordnance supply as may be apportioned for manufacture within the geographical confines of the designated district in the event of an actual or threatened emergency.

The above quotations from the National Defense Act and the Ordnance Office Order which created the ordnance districts as they now exist, illustrate a cardinal principle of district operation which Reserve Officers too frequently fail to remember. The authority exercised in the district is a delegated authority and financial operations carry a fiduciary significance which must be observed.

Under the Constitution, Congress alone has the power to "raise and support armies." Its actions exercising this power are laws, and monies can be expended or obligated for expenditure only when, as and if, authorized by Congressional appropriation.

Ordnance district headquarters is then an instrumentality of the Government of the United States deriving its powers from authority delegated by Congress, organized to operate under the supervision of the district chief for the purpose of assisting him to perform the duties with which he is charged. It is a gear wheel in a large and complicated mechanism. It must mesh accurately with fourteen other gears performing identical functions. All of them must work smoothly with the related parts with which they are in contact. The principal characteristics of their structure should be identical so that their inter-related activities and operations with other Governmental agencies may be facilitated.

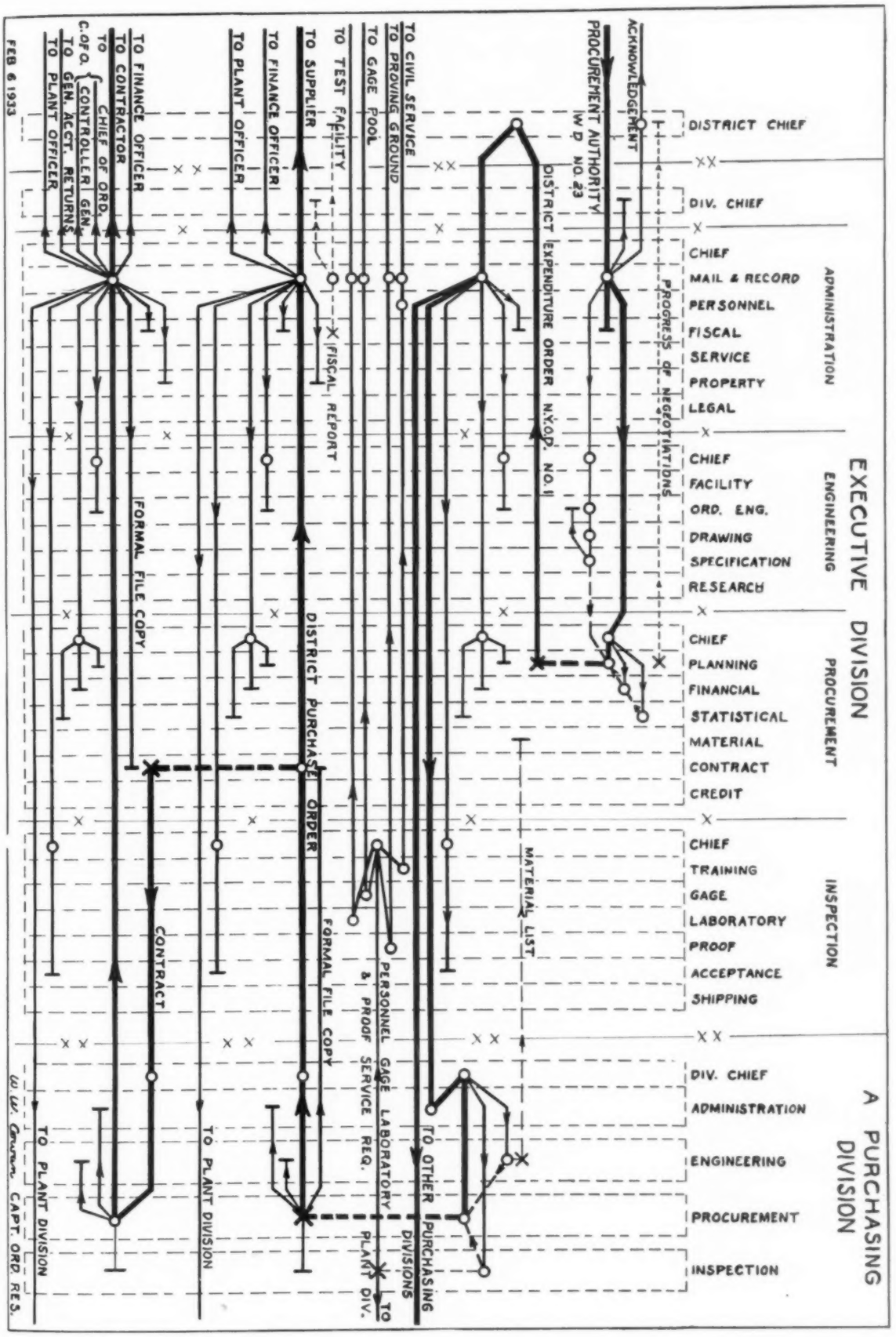
The principal functions of the district headquarters are defined by the order establishing the Ordnance districts. They are, first, the arrangements whereby the articles of ordnance apportioned to the district may be furnished in the quantities and at the time required; second, the inspection of the articles provided to insure that they are in accordance with specifications; third, the arrangements for adequate and legal payment to the supplier. All other activities are in support of these three principal functions.

THE type of organization used in this study is predicated on the principle that the ordnance district headquarters is a division of the Manufacturing Service of the Ordnance Office and as such should be modeled upon the organization of that service and not upon the Ordnance Office as a whole. Such additional functions, which are counterparts of that portion of the Office of the Chief of Ordnance known as the General Office, made necessary by decentralized operation should be included in the general administration division and not be made the basis for a departure from Manufacturing Service organization to one approaching that of the Ordnance Office itself.

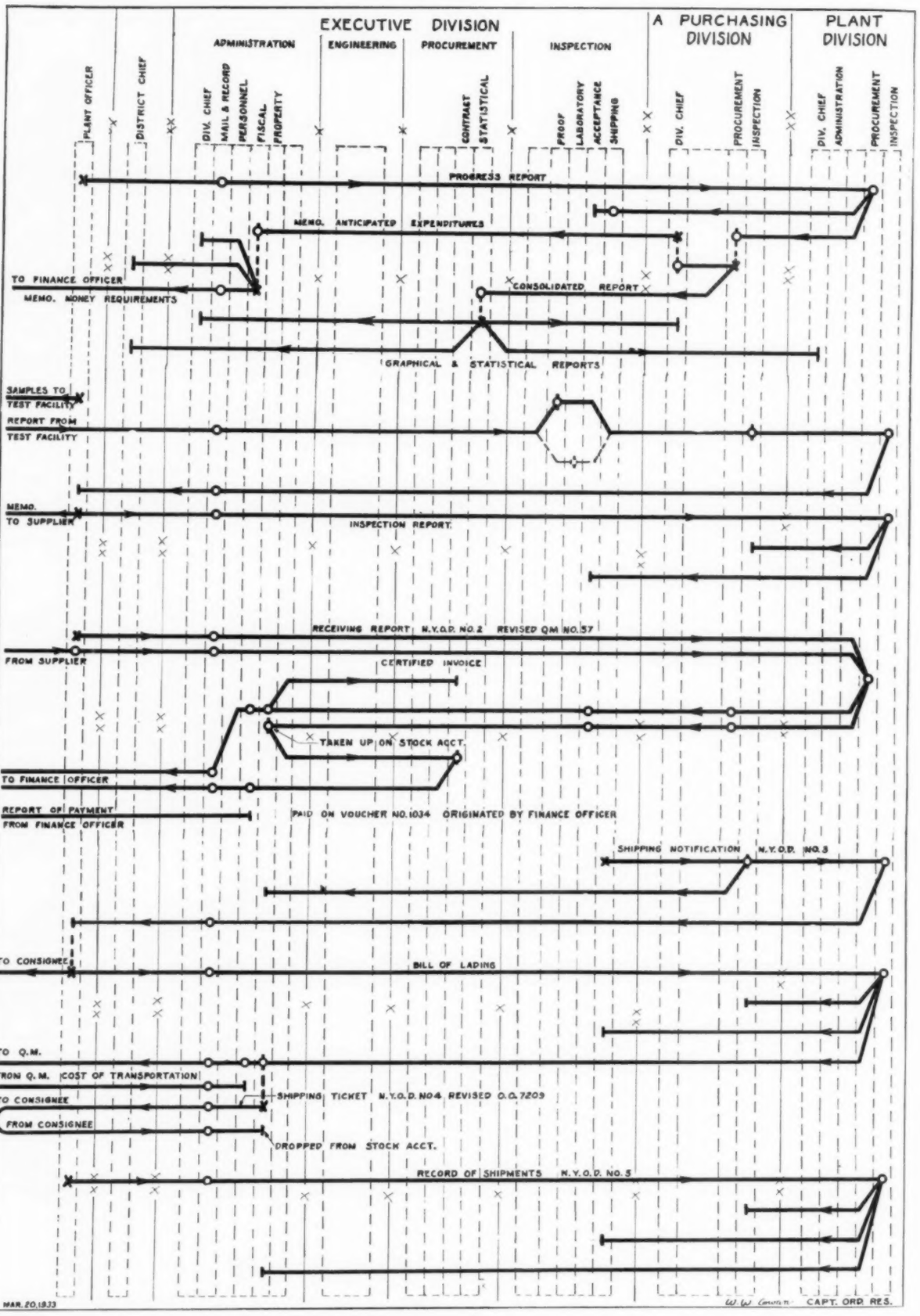
A second principle has its basis in the fact that in any major emergency, operations are conducted upon two "fronts:" one in the theater of operations which consumes supplies and a second in the zone of the interior which manufactures supplies. The forces operating on each front should be relieved to the greatest possible extent from routine supply administration, or quoting from the Field Service Manual, "the impetus of supply should be from the rear."

The functions of district headquarters fall naturally into four sections: The first two comprise the assisting and guiding group; the last two are the operating group: (1) Administration, (2) Engineering, (3) Procurement and (4) Inspection. The ideal District Headquarters organization to perform these functions consists of six major divisions; the Executive or General Office Division for general administration; and five Purchasing Divisions: (1) Artillery, (2) Automotive, (3) Ammunition, (4) Small Arms and (5) Gage. Each division is divided into the four functional sections, administration, engineering, procurement and inspection. Inter-related

*Chief of Ordnance Engineering, New York Ordnance District, Captain, Ordnance Reserve, U. S. Army.



FLOW CHART OF WAR-TIME PROCUREMENT OPERATIONS IN THE NEW YORK ORDNANCE DISTRICT—THE SUCCESSIVE STAGES OF HANDLING A PROCUREMENT AUTHORITY.



Flow Chart of Progress, Inspection, Receiving and Shipping Papers in the Procedure of the War Organization of the New York Ordnance Procurement District.

Governmental activities practically dictate the subdivision of the executive division into the groups shown on Chart I. The sections of the purchasing divisions are subdivided as required by the articles assigned to them for control. This type of organization definitely places the entire responsibility for *all* the activities connected with the procurement of any article exactly upon the chief of the designated purchasing division, all being coördinated by the executive division.

The second principle of relieving the operating forces to the greatest possible extent from routine administration makes it seem advantageous to add two subsidiary divisions; a staff division for special investigations and contacts not part of definite procurement operations; and a plant division for routine administration of the field plant offices.

In the operation of a district organized as shown in Chart 1, certain functions are required to be performed promptly, accurately and completely upon each job given to the district by competent authority. The procurement authority is the principal form in which a job is transmitted to a district.

The accompanying charts detail the principal operations necessary from the receipt of a procurement authority to the shipment of the completed accepted article. The charts are self-explanatory. The heavy line indicates the sequence of principal operations; the light line, secondary operations; the dotted line, reports. The cross (X) marks the origin; the circle (o), intermediate operations; and the bar (1) the final destination of information.

IF there is one official document with which an Ordnance reserve officer of the branch assignment group should be familiar, that document is a procurement authority. The military personnel of the district is ordered to active duty and paid by agencies external to the district but once on duty at the place of assignment every action has to do with a procurement authority. The authority to procure items of ordnance, even the cost of equipping the headquarters office and the pay of the civilian personnel to complete the organization, all originate in a procurement authority which may actually be the official document itself or a letter or telegram containing a number.

A procurement authority, W. D. Forms Nos. 23 and 23a, is common to all supply branches and is the authorization by the chief of branch to expend designated funds for services or supplies. It carries a number, all parts of which are important, identifying the branch and serial number, the General Accounting number, the budget project, and the appropriation which made the funds available. It states what action is to be taken and allots funds for that purpose.

A second form which is almost equally important is the district expenditure order. These are numbered serially. They are the authorization by the district chief to the individual division for the expenditure of funds as directed by the procurement authority.

Referring to the Chart I; the procurement authority, an original and two copies, is received in the mail and record group, administration section, executive division. The original is routed direct to the chief of the fiscal group of the same section who carries the money accountability for the district. The fiscal group sets up the necessary accounts for control purposes. One copy is routed through the district chief to the issuing authority as acknowledgment of receipt. The mail and record group prepares additional copies which are routed as shown. One copy is routed through the engineering section where a work sheet is prepared containing pertinent engineering information and latest drawings, specifications, etc. The planning group, procurement section, executive division originates one or more district expenditure orders for the signature of the district chief. This planning group supervises and is in general charge of all procurement and related activities, it directs, surveys and allocates facilities within the district and when necessary obtains allocation of additional facilities from higher authority.

Chart II has two agencies which do not appear on Chart I: a plant division and a plant officer. The plant division as stated before, is designed to centralize the routine administrative control of the offices in the field; to relieve the chiefs of the purchasing divisions from the routine administration of these field offices so they can concentrate on the important activities of their divisions. The plant division in no way detracts from the authority of the purchasing division chief, he is completely and solely responsible from the time he receives an expenditure order to the shipment of the completed article, for the procurement of articles assigned to his division.

THE charts need no explanation. One point, however, may call for comment. Component parts produced and accepted within the district and shipped to an assembly plant within the district call for a slight variation in the property procedure. In this case the physical location of the parts and the responsible officer change but accountability still remains with the district property officer who is the chief of the property group, administration section, executive division. The shipping ticket for the component article is receipted by the plant officer at the assembly plant and also by the assembly contractor for incorporation in the finished product in accordance with the assembly contract. On the shipping ticket for the finished product the property officer drops a proportionate amount of the component article. An unexpended balance is disposed of as directed by the shipping and storage group, inspection section, executive division and dropped in accordance with this action. Items unaccounted for as above are dropped on a certificate by the plant officer and contractor, approved by the division chief, that such items represent normal manufacturing and inspection losses.

There are six groups in the executive division of this proposed headquarters organization which maintain centralized information concerning essential activities. In the administrative section the chief of the fiscal group is the fiscal officer of the district and is accountable for all funds; the chief of the property group is the property officer of the district and is accountable for and maintains a stock account for all district property. In the procurement section the planning group maintains information as to procurement planning and the manufacturing capacity of the district; the contract group maintains the official purchase order and contract file. In the inspection section the acceptance group maintains information as to the exact status of each purchase order in respect of items accepted, balance due and anticipated deliveries; the shipping and storage group is the source of all shipping orders.

The organization provides a skeleton claims board which maintains current knowledge of contracts and orders to allow for prompt settlement of all matters pertaining to contracts.

In this method of operation the organizational divisions follow natural lines, responsibilities are clearly and definitely placed, duties are simple and control is direct and certain.

ARMY ORDNANCE

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Month by Month

ALL signs point in the direction of a program of mechanization and motorization of the Army—eventually. Many observers have felt that nothing would be actually authorized until the Disarmament Conference, like its counterpart the Economic Conference, had come to a sure collapse. Time, as usual, will tell. An issue may have to be made of it here at home but the idea is sound so that success should not be delayed.

MECHANIZATION AND MOTORIZATION

The Secretary of the Interior, Mr. Ickes, who is also Public Works Administrator, told press correspondents recently that the modernization programs for the Army and Navy "had no chance." On the other hand the position of the Secretary of War and the Secretary of the Navy is well known; both are backing the programs for their respective services as necessary for national defense and as a most expeditious form of reëmployment. There is no doubt about modernization of military and naval equipment accomplishing both purposes. The statement made in these pages earlier in the year as to reëmployment's share in these public expenditures still stands. At least 85 per cent of every dollar spent for military mechanization and motorization will go for labor, the same distribution applying to expenditures for naval equipment. If the programs have been shelved as Mr. Ickes intimates, the country should know about it; if there is a tentative agreement that some $80,000,000 for motorization and mechanization of the Army is an ace in the hole pending the Geneva windup the country should know about that too. Both ifs are possibilities; the latter is a good probability as well. It is just a question as to how long the endless talking abroad will keep up. Maybe the alert diplomats, sensing the importance of their long-windedness at the moment will filibuster until all the public works funds are allotted, thus accomplishing a very useful function so far as they are concerned.

The plain facts of the matter are: (a) Mechanization and motorization of the Army were specifically provided for in the recovery legislation; (b) The Army needs this modernization, (c) Any program of modernization will effect the twofold object of employing great numbers of artizans in all the major industries for a long period and of renovating a military machine that is out-of-date in fighting equipment. All this being certain, we can wait just so long for the Geneva experts to add their mite to the collection of "famous last words." Where there is so much to be gained for ourselves by prompt embarkation on the mechanization and motorization program for the Army our recommendation would be to let the talk proceed but let's get going. Watchful waiting is small consolation to the unemployed and still less to our military organization as it plods along with only a handful of newer types of equipment to admire and a collection of outworn, outmoded, lumbering old curios to try to keep running. If mechanization and motorization of the Army means anything at all as a public works measure let's sound off and snap into it now.

FEW articles in ARMY ORDNANCE in recent months have attracted more favorable comment than the one of the series on "The Identification of Firearms" by Major Hatcher which was published in the last issue. The elaborate description of the Stielow case seemed to have so much human interest in it that the Editor is tempted to believe readers would like to have their ordnance literature tempered with those tidbits of adventure and mystery for which the "pulps" are famous. In any event Major Hatcher's description of the case has produced for the record an interesting historical sidelight which should be known by all students of ordnance, particularly those interested in small arms and their identification in the war on crime. The following historical data were recalled to the Editor by no less a distinguished reader than Maj. Gen. William Crozier, U. S. Army, Ret., Chief of Ordnance from 1901 to 1918, whose name everywhere is synonymous with ordnance achievement.

FIREARMS IDENTIFICATION

Although the Stielow case may be called the jumping-off point for the new science of forensic ballistics, it had its counterpart in the earlier development of firearms identification in connection with the Brownsville affray in 1906. For the benefit of younger readers of these pages, the following description of the Brownsville incident is quoted from the annual report of Brig. Gen. A. L. Myer, U. S. Army, Commander of the Department of Texas in 1907:

"The most important event in this department during the past twelve months was the disturbance which took place at Fort Brown, Brownsville, Texas, on the night of August 13 and 14, 1906, a lamentable occurrence which is still shrouded in mystery to a great extent. However it seems to have been established that on the night in question a few enlisted men of the First Battalion, Twenty-fifth Infantry, then garrisoned at Fort Brown, did go armed into Brownsville and do some promiscuous firing, resulting in the death of one civilian, one horse and the wounding of one policeman. Up to the present time it has been impossible to locate or identify the individuals who actually did the firing. Undoubtedly there was at that time mutually bad blood between parts of the garrison."

What appears to have been one of the earliest instances of

firearms identification grew out of this incident. We quote from an annual report for 1907, that of General Crozier, then Chief of Ordnance:

"With a view to developing the full value of the circumstantial evidence adduced in the investigation of the Brownsville affray, in so far as this evidence comprised ordnance material, the Department undertook an investigation, the object of which was to identify the rifles from which the bullets and cartridge cases, received in evidence, had been fired.

"With this end in view a trial was made at Springfield Armory to determine the possibility of ascertaining from a microscopical examination of the gun marks on a fired cartridge the fact that such an identification was possible by virtue of the characteristic markings on the various external surfaces of the cartridge case, produced by the similar complementary markings in the chamber and on the breech mechanism of the rifle.

"The possibility of such an identification having been established by actual trial, all of the cartridge cases received in evidence and all of the rifles which had been at Brownsville in the hands of troops, at such times as would render it possible for the cartridge cases to have been fired from them, were sent to the Springfield Armory for comparative microscopical examination. As a result, it was found that of the 39 cartridge cases in question, 11 had been fired from the same rifle, 8 from another rifle, 11 from another rifle, and 3 from a fourth rifle, the remaining 6 having insufficient gun marks to classify them. The markings on the cartridge cases of each group were then compared with the markings produced by all of the above-mentioned rifles, through the medium of auxiliary cartridges fired at Springfield in each of the rifles. In this way it was found that the cartridge cases comprising groups one, two and three had been fired in three rifles belonging to Company B, Twenty-fifth Infantry, and that the cartridge cases of group four had probably also been fired from another of the rifles in the same company.

"A somewhat similar investigation was made in regard to the bullets recovered from Brownsville and received in evidence before the investigating committees. As the bullets bore no distinctive gun markings, as did the cartridge cases, it was necessary to base their identification upon their design and dimensions and upon the dimensions of the rifle bore. Proceeding along this line by the method of elimination, it was finally established that the bullets were United States model of 1898 or United States model of 1903 bullets, and that they had been fired from either the United States model of 1898 rifle or from the United States model of 1903 rifle, and from no other.

"The bearing of these facts upon the identity of the persons doing the firing and upon the time when the cases and bullets were fired in the guns is not a concern of this Department."

Two conclusions are obvious from the above excerpt. The first is that the identification of arms and bullets was at least in its incipient stages as a science in this country nearly a quarter of a century ago, and the second that annual reports of government officials are a repository of historic information which is not always given its face value when published. And, lest we forget, a third conclusion is that a proper understanding of ordnance has a direct bearing on crime prevention. It is high time that accredited experts on the subject be recognized and the quacks who go about the country throwing wrenches in the machinery of justice be disqualified. That may be too much to expect soon. We acknowledge doctors when it is a question of the prevention of disease, lawyers when it is a question of prevention of injustice, but most anyone who can fire a gun thinks he knows all about it. No greater crime prevention service could be performed by members of our Association than that of helping to put this important science of arms identification on a sound footing in the minds of all prospective jurors.

REGROUPING THE ARMY

ANNOUNCEMENT has been made in general terms that coincident with an allotment of $50,000,000 for housing at Army posts and stations a redistribution and consolidation of the United States land forces will be made around a nucleus of fifty permanent Army camps. This means that the Army housing project will soon be under way and that the much-needed improvement in living conditions of our Army personnel will at last be undertaken. At this writing the complete list of posts to be modernized has not been made public. We hope that Ordnance establishments will not continue to be conspicuous by their absence.

The release of public works funds in the amount of $50,000,000 for Army housing accomplishes two very useful purposes. The Army has been ready these many months to begin construction work at the drop of the hat offering a quick means of unemployment relief. There will be no delay when the final word is given and, while many public works projects have backed and filled without affording an outlet for the unemployed, this project will have no strings tied to it. The work will be undertaken with military precision and promptness. The Army has been waiting these many years for better housing conditions for its personnel. Scarcely a military post but that officers and men are still quartered in weather-beaten unsafe structures erected during the World War for a maximum life of a few years. Army personnel has been placed under handicap after handicap. Its morale has not been improved by pay cuts, pay freezes and least of all by unsatisfactory living conditions. This allotment should go a long way toward correcting a condition that is nothing less than a disgrace.

But when it comes to scrapping Army posts all may not be plain sailing. If the housing allotment really depends on getting rid of useless posts the enterprise may be very uncertain at best. The Army has been trying for years to abolish some of its stations which outlived their usefulness generations ago. When the Secretary of War in 1931 announced that 53 Army posts were to be abolished protests from the localities concerned were so great that actually only five stations were eliminated. There are some 210 Army stations in the United States of which some 60 are on inactive status. Whether the present plan contemplates doing away with the inactive 60 only is yet to be learned.

Many students of our Army will welcome the plan to concentrate our small forces in the United States so that larger numbers will be located at fewer places. There is little sense in holding on to a fort or camp forever simply because at some period in the dim and distant past it was an outpost to prevent Indian raids. As the collection of antiques grew and personnel in small numbers continued to be stationed at them, it finally became a fact that any sort of military maneuver other than close-order drill for a squad or two except at a

few of the larger posts is out of the question. To maintain these venerable but widely scattered institutions with our small skeleton Army it turned out that the Army was losing its ability to train officers and men in command and execution except by the mere handful. It was a case of simulated squads, simulated platoons and simulated companies ultimately simulating a division with the whole thing so skeletonized that any so-called maneuver was a grand make-believe. We are inclined to agree with the concentration part of the housing project—real homes and real maneuvers by real bodies of men will improve military efficiency tremendously. Our Army personnel can not go on living in shacks forever neither can make-believe troops solve tactical problems with any degree of certain success.

When we train a division in maneuver let it be a division of men where regiments are regiments, battalions are battalions, companies are companies and squads are squads. Let every unit be a unit in the flesh—so much so, in fact, that after a day of real soldiering its members, with command exercises performed and military efficiency in high gear, can go home to decent quarters and lie down to pleasant dreams.

AN English writer was recently discussing the economic boycott as a peaceful substitute for war in the settlement of international differences. He concluded that the economic boycott in the long run is simply "peace by starvation" which quite rightly it is. The question logically arises then, where is the great humaneness of the boycott? If by boycott a group is starved to submission or death there is not a great deal of sense in substituting lack of food in place of preponderance of machine guns, bombs or artillery fire. In the final analysis both methods produce the same result. Which then is the more humane method?

PEACE BY STARVATION

History is replete with boycotts under other names. Many of them proved to be less effective and more inhumane than the swifter and manlier arbitrament of arms. The word boycott itself has an interesting background. It was first used in Ireland in 1880 and is derived from the name of Capt. Charles Cunningham Boycott who, as agent for the Earl of Erne, refused to accept rents at figures fixed by his tenants. The tenants thereupon "boycotted" the captain. His property was damaged, his life threatened, his letters intercepted and "his food supplies interfered with." Finally a force of 900 soldiers was required to rescue him from the irate tenants. From then on the term has come into general use meaning the refusal and incitement to refusal to have commercial or social dealings with any one on whom it is desired to bring pressure.

But the object to be gained by boycott was identical in its purpose with one of the aims of the siege of old. A siege literally is the "sitting down" of an army or military force before a fortified place for the purpose of taking it either by military operations or *by starving it into submission*. Starvation was often the cause of capitulation. The annals of siege warfare contain many examples of heroic defense against a vastly superior attack as at Candia the capture of which was effected only at the cost of 100,000 Turks. Clive at Arcot is a sterling case of the correctness of the French phrase *Tant vaut l'homme, Tant vaut la place*. Against 10,000 native troops Clive with two 18-pounders, 8 light guns, 4 officers and 300 men held the fort for 50 days after which the enemy finally decamped.

In similar vein are the historic defenses of Livron in the sixteenth century, Rochelle and Saint-Jean de Lone in the seventeenth. In more modern times the obsolete Maubege withdrew German forces from participating on the battlefield on the Marne. But greatest of all, it seems to us, was Petain's *"Ils ne passeront pas"* at Verdun. Good examples of the military axiom that in time of emergency the moral is to the material as three is to one!

Peace by starvation versus peace by open or closed warfare, any way you look at it, doesn't seem to have much to debate about because both horns of the dilema are the infliction of physical suffering. Both will do that and both stand a likely chance of achieving the same end. The boys and girls who press for the boycott, however, paint in rosy hues. They say the economic boycott will take the barbarism out of war; that it will accomplish by moral suasion what mankind has tried to do only by physical force. For ourselves we cannot escape a homely example. If Machine-Gun Kelly is about to assert himself along unfriendly lines, starvation may be tried, of course, but a rifle or an automatic will put Mr. Kelly where he belongs much more quickly. If time is of no immediate concern the boycotting or starvation process can be tried. But whether that desperado is subdued by the pangs of hunger or by a few well placed shots, physical force of one kind or the other does the job. And nothing else will do it but physical force. The comical part about the theory of the boycott preachers is that when you starve a man or a group of men you are humane but when you don't starve them but make them come to terms by other kinds of force, then the thing is brutal, terrible and hellish!

VERY often when a new book emerges from the press some well-known individual steps forward to say "I wish a copy of this might be put in the hands of every school boy and school girl in the United States." Or if the text is of a special nature, for instance, "Every homeopath in the land should see that." Or again, if the printed data in question are of particular reference value, then for example, "All legislators in the country should have a copy of that." Not always is this kind of advice given without some ulterior motive. The school boy and school girl population, the homeopaths, the legislators and the rest will get along somehow if wishes are not always translated into action. There are exceptions though where the advice can be taken literally.

INDUSTRIAL MOBILIZATION PLAN

This revery springs from the reading of an inconspicuous little pamphlet of some one hundred pages entitled "Industrial Mobilization Plan, 1933," bearing the approval of the Secretaries of War and Navy and the imprimatur of the Government Printing Office. It is a bona fide case where the recommendation can be made with all fervor and sincerity: every student, friend and interested observer of industrial preparedness should have a copy. It is the finest thing that has come out of our thirteen years of industrial mobilization planning. To make certain that there is no sales promotion hidden away in the recommendation we hastily add that copies

may be procured from the Superintendent of Documents, Washington, D. C., at fifteen cents each. Readers who feel that representation at Washington is helpful in all business negotiations to which the Government is a party may avail themselves of the good offices of ARMY ORDNANCE to procure copies. Remittances with five cents added for domestic postage will be hustled to his excellency the Public Printer and copies will be forwarded promptly to purchasers. Without ARMY ORDNANCE as the profitless middle man "consumers" will save the postage factor by dealing direct with the Public Printer. Either way, this classic should be among the few reference papers on the subject of every citizen who wants to know how the industrial machine of modern war will be thrown into gear whenever that steep grade must be climbed again.

The Industrial Mobilization Plan—1933 is a revision of the plan for industrial mobilization submitted by the War Department in 1931 to the War Policies Commission appointed under the authority of Public Resolution No. 98, Seventy-first Congress, second session, and published in part 2 of the hearings before the Commission. Portions of the earlier plan were published in this Journal. The present revised plan has taken the recommendations of the Commission into consideration and, moreover, represents the collaborated efforts of both national defense services. The labors of the two departments have been coördinated by the Army and Navy Munitions Board. The result is far and away the most comprehensive and satisfactory mobilization plan in the history of our national defense.

The mobilization plan is so closely related to the very existence of the Army Ordnance Association that these pages will see frequent reference to it. It is a veritable ten tables on which the doctrine of industrial preparedness stands from now on. Enough here to say a word of praise for those whose brain child it is. Their name is legion. Their work extends back to the morrow after the passage of the National Defense Act of 1920. From that day with the record of 1917-1918 before them, with their own personal experiences to guide them, and with the counsel of those who carried the burdens of the war days in positions of high administrative responsibility to help chart the course, the plan has been evolving. It experienced, as all magnificent undertakings must, the early glamor of exaggerated concepts, the dreary detail of the academic mind, the doldrums of disinterest by occasional officials who refused to excite themselves over a theoretical thing which might have no practical application during their official lifetimes. These were precisely the evolutionary steps which make the completed plan all the more valuable. Now it is not a mythical result, or a chameleon-like probability but an actual reality in black and white. Happily the framers of the plan have enunciated principles rather than details. They have indicated the broad outline leaving detailed application to fit the problem as it will exist. To every one who had a hand in its preparation the appreciation of the present and the success of the future will be thanks aplenty. The undertaking was begun and completed in the spirit of our preparedness magna carta, the Defense Act. With its completion the whole nation can begin to apply it in its many ramifications. Its real utility will depend on constant study and detailed application. From this general plan will emerge its detailed applications to every form of enterprise which the nation at war must mobilize and direct. Fitting it is that we close this first reference to the handbook of our planned economy in time of war with a quotation from the foreword as showing the sound basis on which the plan is drawn: "The objective of any warring nation," the foreword concludes, "is victory, immediate and complete. It is conceivable that a war might be conducted with such great regard for individual justice and administrative efficiency as to make impossible those evils whose existence in past wars is well-known. It is also conceivable that the outcome of a war so conducted might be defeat. In all plans for preparedness and policies to be pursued in event of war it must never be overlooked that while efficiency in war is desirable, effectiveness is mandatory."

FROM DISARMAMENT TO ARMS CONTROL

IT is amusing to observe how deftly the statesmen who have been engaged in preliminary conversations about what to do at Geneva have suavely changed front. This time last year the hope of the world lay in real disarmament. The experts were going to call this gun aggressive and that non-agressive. Having made the division the disarmament dilemma would be settled at least until the next conference was ready to be called. Now the statesmen have left off talking much about aggressors and consultative pacts; they are training their own heavy artillery of words on a plan for arms control. This seems to be aimed entirely at Germany's threat to rearm. One faction in France takes the position that adjournment at Geneva without some agreed method of control will be fatal. French Nationalists still contend that the only security lies in strong action by France alone.

Some reports from abroad have indicated that any armament control measures will be strictly European in scope. Truth to tell one will search in vain to know the reason why this obvious step has not been indicated long ago. Neither that arch-conferer, our own Mr. Norman H. Davis, who is our spokesman at Geneva, nor his technical assistant, Mr. Allen Dulles, will ever be able to argue otherwise with the plain American citizen. That is the reason why our representation at Geneva has always been questionable. It is the reason also for the stern American protest which has been gathering constantly in volume over threatened agreements in which our own military status has no semblance of connection. It will be interesting at least to watch the maneuverings at Geneva during the coming weeks. Our guess is that not much talk will be devoted to the classification of aggressive and non-aggressive weapons as held the Conference spellbound last year. The turning movement has come through well thought out diplomatic maneuverings to the position where arms control takes precedence. In other words, it is a case of those countries adjacent to or in close proximity to Herr Hitler's Pan-Germanic efforts trying to stem the tide of rearmament. This will be the immediate problem in hand. Whether the problem will be solved remains to be seen. Meantime it is comforting not to have to read dispatches from European capitals about definitions of an aggressor.

General Fuller, in the last issue of this Journal, wrote that the man who decided upon the French definition of the aggressor was "either a lunatic or a humorist." The draftsman of this definition it may be was far from a lunatic nor was he in the ordinary sense a humorist. No doubt he

laughed in his sleeve when the definition was drawn—a cynical humorist in any event. It is highly desirable that the European nations among themselves make a clean search of the problem which has faced them since the World War. Arms control may be a method of doing so. At least it is worthy of trial by those who are directly concerned. Those who are more fortunately situated have an advantage which they should hold to at all costs. Self-control has been exerted so efficiently in this country insofar as our Army and its armament are concerned that there is no earthly reason for further control measures. Our worry is not that our military armament will become excessive, there is no danger of that. Our greatest danger lies in the absence of control to prevent our Army and its equipment from becoming too small. A problem like this demands domestic solution. We had better look to our own minimum requirements and let others who fear excessive maxima settle that among themselves. Policy of this sort may be frowned upon as in opposition to a general spirit of international helpfulness. Unfortunately that spirit is shown exclusively by words and not by deeds. If it be otherwise then how explain the reaction—or lack of reaction—in the case of Manchuria and Jehol! The members of the League of Nations seem to be in agreement in spirit but the spirit is unwilling and weak.

OBSERVANT followers of the progress of industry's codification under the Blue Eagle are expressing some trepidation over the flagrant attitude of organized groups. Inordinate demands on the part of some representatives for the extinction of all other forms of organization are slowing up the otherwise advantageous performance of the NRA. Indeed, these organizational activities of certain influential groups are negativing a great deal of the constructive achievement begun so promptly and so wholeheartedly by industry as a whole.

PUBLIC SERVICE AND THE BLUE EAGLE

This difficult peak in the flight of the Blue Eagle has overshadowed a group of public servants who have never been known to strike and who have never laid down inordinate demands. They are the personnel of the defense services—officers and men and civilian employees. They labor under handicaps so severe that not only is their morale affected but the quality of their craftsmanship is in jeopardy. In the services the fifteen per cent pay cut still applies to active and retired alike. This, in itself, is not damaging, and already there is indication that the rising cost of living will force its modification. It is damaging though to the younger officers especially. Their rate of pay is at best meager and when it is reduced together with other emoluments, as they have been, there is no spread to take up the slack. The younger officers are hard hit. So are the enlisted men who have lost, in addition to the pay cut, some of their clothing allowance, many their extra hard-earned pay for qualification in arms, all their reënlistment bonus. The civilians too labor under pay reductions, enforced furloughs, lessened leave with pay, etc. Then there is the "pay freeze" an unjust thing in every respect and especially so far as younger officers are concerned.

No one asks that the beneficent Blue Eagle spread his wings over these public servants. The spirit of his presence, however, should not permit injustices. Majestic bird that he is he usually brooks no intimidation from the turners of the industrial wheel he now holds aloft in his right talon, neither will he, if he is the wise old bird he is supposed to be, allow the shafts of his left to impose unfair hardships on those who support him so effectively without code or agreement and without murmur.

INDUSTRIAL preparedness will be made simpler in some respects and more complex in others by the new industrial order now in formation. Simplicity will result from the organization of industries via the trade associations; complexity will come from the detailed changes in methods of production. The net result will be all on the credit side of the ledger.

THE CHANGING INDUSTRIAL ORDER

When we look to the way things had to be done in the World War it is quite apparent that the lack of industrial organization was the principal stumbling block. We were then an industrial nation, quite true, but without the loose strings tied together. Some of our major industries were an amalgamated unit speaking the same language, following the same practices and withal thriving under a competitive system which is part and parcel of the American tradition. But not all were so unified in purpose and in method. Had they been so, the cost of our World War bill could have been discounted. We were delayed, when delay meant lives and money, by this early lack of unification almost as much as we were by that assinine administrative prohibition of any kind of military preparedness until the very dawn of the zero hour. It was not until the General Munitions Board under Scott and later the War Industries Board under the same far-visioned direction began the work in hand that the full significance of the need for industrial coördination stood out in startling relief. That work in its beginnings and in its full growth was nothing less than the beginning of the new industrial order. From it has grown the whole method of attack by its peacetime successor of today. The method worked in war because it had behind it sane judgment and behind that the popular enthusiasm of the nation at war. The method applied in peace has just as many things in its favor, one of them being the simplicity of the industrial war task if it is ever imposed again. Our present peace industries board could become a war industries board overnight. The time lag of organization would not be lost. Industry being coördinated would make the transition with little or no effort, industrial mobilization would have its capacity and its requirements ready to submit to industries already organized.

The complexities are yet to develop. They are of detail and not of principle. Changes in methods of manufacture will be more frequent than heretofore; changes in machine design, in man-hour production, in the application of hitherto untried methods, all these will bear upon the capacity of a given plant to meet its estimated war schedule—possibly not in the ability to meet but its added capacity to exceed. The individual producer who is now counted upon to produce munitions in time of war, if he survives the period at all, will be in a position to do more rather than less. Industrial preparedness connotes an accurate knowledge of these changes through the tremendously important surveys of the district procurement agencies. Surveys will have to be kept current.

Relativity of Pacifism

An Editorial

PROFESSOR ALBERT EINSTEIN, the noted physicist and mathematician, has astonished the world on more than one occasion with his pronouncements. Two of these particularly were heard around the globe. One announced a theory which is not at all understandable to the average man, the other proclaimed a doctrine which is. The first—the Einstein theory of relativity—is a little too deep for all but a choice dozen of the world's population. The second—the Einstein right-about face on pacifism—is so plain that the man in the street grasps it readily. We can elaborate no further on the first pronouncement because, not being among the choice dozen, we have not the slightest idea what the Einstein theory of physics is all about. As to the understandable pronouncement, in which the Professor scraps his previously held crazy notions about war and comes back to common sense, it is all so clear and convincing that it is deserving of comment.

The good Professor, with whom all charitable individuals will sympathize in his present unfavorable plight with the reigning powers in his native country, had been a militant pacifist until recently. While still a pacifist he had lost no opportunity to decry at every turn the absurdity and uselessness of national defense and he had preached this doctrine on innumerable occasions in innumerable places much to the chagrin of those who admired him for the scientist they were told he is. The Professor once went to the unbecoming length of sending a radio message from the high seas to some of the extreme pacifist organizations in our country, although he had just left our hospitable shores, urging them to refuse military service always and at all odds. Such leadership in a field in which the Professor is not particularly qualified may have been all right, assuming his good faith. But many observers who have not forgotten the practical things of life as the Professor apparently had in this instance, realized that it is one thing to berate military service when one's physical well-being and property appear to be immune from danger and quite another thing when the hard realities of force are actually at hand.

Proof that pacifism and refusal of military service are relative after all, is now furnished by this great apostle of peace. Professor Einstein is quoted in a recent issue of the *New York Times* as having written in a letter to the Belgian pacifist, Alfred Nahon, "If I were a Belgian I would not refuse military service under the present circumstances (i.e., the German situation) but I would on the contrary accept it with a clear conscience with the sentiment of a contribution toward securing European civilization." So relativity, embracing the entire cosmos, quite rightly includes pacifism!

We venture to observe that believers in the Utopia of disarmament and all the loud-sounding opponents of munitions and munitions-makers are pacifists only in this relative sense. They too may be no more consistent in adhering to their expressed beliefs when trouble knocks at their own doorposts than the Professor who now leads the way along which a growing body of spokesmen in this country can follow. Surely there is this growing and persistent group in our midst. One does not have to hunt far to find it. We have selected at random some very interesting exhibits of pink nonsense of this type, the mere recital of which is its own reproof. These exhibits coming from sources of great influence, show quite plainly that the ranks now led by Professor Einstein in his right-about face are calling for recruits. The evidence further shows that leaders of thought in academic and literary lines might well stick to their knitting and not put themselves in the unenviable position of the Professor who left off studying the universe to venture into a field in which he was not expert at all. The list of exhibits follows:

EXHIBIT No. 1. "The next war is already discussed as a certainty in many offices, grocery stores, street corners, club lounges, and smoking cars where men idle the time away with loose talking and muddle-headed conversation. While statesmen are bargaining (*sic!*) together for armament reduction and peace treaties, men who ought to know better are reasoning from ignorance and drugging themselves into a helpless frame of mind. The homespun citizen who flounders about among big subjects is as much an enemy to peace as imperialistic governments."—*Dr. Mary E. Woolley, president of Mt. Holyoke College and delegate to the Geneva Disarmament Conference in an address at the Westport Union Service, Westport, N. Y., August 27, 1933, as reported in The New York Times of the following day.* (Parenthetical query on Exhibit No. 1: Has it ever occurred to Dr. Woolley that the office-grocery store-street corner-club lounge-and-smoking car debaters may be as fully competent, as whole-heartedly sincere in their discussions as many of the stuffed shirts who have discussed the same subject at international conferences? Still parenthetically: Are not these homespun debaters as much entitled as any of the so-called diplomats, experts, agenda-builders, international bankers and promoters as were the delegates at Geneva? These latter, be it remembered, quite idiotically have said that the chances of war drop to nearly zero when, after some weapons are called aggressive and others non-aggressive, those marked aggressive are prohibited?)

EXHIBIT No. 2. "We cannot sit idly by and wait for the politicians to bring about real and reciprocal disarmament. Unless public opinion is alert and mobilized the munitions ring (*sic!*) will continue to bully the well intentioned politicians and bribe the corrupt into a toleration of present evils. The secret, sinister, and dangerous alliance between the great munitions firms and the governments must be broken or war is inevitable." . . . "There has been much ignorance and some cowardly silence concerning the 'munitions racket.' The business must be controlled. It must be nationalized and divorced from private profit, and the international traffic in arms must be regulated by a vigorous and watchful board."—*Rev. Laurence K. Patterson, Professor of History at Fordham University, in an article "Disarm the Munitions Makers" in the June 3, 1933, issue of "America," published by the American Press, New York, N. Y.* (Parenthetical query on Exhibit No. 2: Has it ever occurred to the good pedant that before an American munitions ring can "continue to bully" there must first be an American munitions ring? Teachers of history are presumed to deal in facts—not fancy.)

EXHIBIT No. 3. "Every government today has a paper scheme of its whole country mapped out as a vast arsenal, a scheme which is necessarily largely familiar to the armament firms, who are ready to go full steam ahead, when the hour comes. Even the pacific United States Government, for example, has gone to the length of preparing contracts with armament firms to the number of some thousands. And the French Act of February, 1928, for the general organization of the country in war-time is so complete and thorough that it would bring tears of pious joy to the eyes of any armament director. However the general principle, rather than the array of details, is the most convincing proof that governments and armament firms are, if not actually married, at least living together. Understand that principle and you understand the whole thing. It may be put in a very few words. Since all armaments rapidly grow out of date and . . . Since no government can afford to be ill-equipped and . . . Since on the other hand a constant scrapping of guns, airplanes, etc., would be beyond the budgetary capacity of any government . . . It is therefore to the interest of any government that its own armament firms are kept as large, as alive, and as up-to-date as possible."— *Beverly Nichols, in "Cry Havoc." New York: Doubleday, Doran & Company, 1933, published September 6.* (For a review of this twaddle, see Book Reviews, page 116 in this issue of ARMY ORDNANCE.) (Parenthetical query on Exhibit No. 3: Could it possibly be that this barrage of internationalism was timed by the oppulent peace societies as the straw to break the camel's back—considering that it was brought out in England in August and in the United States in September and that the Disarmament Conference reconvened in October? Strange coincidence at any rate, isn't it?)

EXHIBIT No. 4. "The American armament firms certainly profit by trouble in other countries. The official returns of the U. S. A. State Department (*sic!*) show that civil or international war in Central and South America, or even threats thereof immediately result in increased orders for armament firms in the United States. For example, the following table compares the export of aircraft in 1931, a comparatively peaceful year, with that of 1929, which was a year of actual or threatened conflict in the countries named:

	Number of Aircraft Exported from U. S. A.	
Country	1931	1929
Mexico	27	85
Argentina	6	25
Brazil	1	13
Chile	1	40

"The same is true of all forms of armament. Take firearms. Below I give the value of last year's exports of firearms to Argentina, Brazil, Chile and Mexico, compared with the value in years when they were in a state of turmoil:

Country	Peaceful Period	Period of Revolt or War
Argentina	40,078 (1932)	299,565 (1929)
Brazil	59,490 (1932)	618,135 (1929)
Chile	1,103 (1932)	11,308 (1931)
Mexico	15,954 (1932)	370,324 (1929)

"The United States evidently keeps itself in training for war by feeding the wars of Central and Southern America. (I am indebted to the National Council for the Prevention of War for these figures) . . . It is time that the peoples of all nations realized that the armament firms constitute an international conspiracy regardless of motives either of patriotism or humanity."—*A. Fenner Brockway, author of "The Bloody Traffic" in an article entitled "Munitions Morality" in the August 15, 1933, issue of "Macleans Magazine" published by The Maclean Publishing Company, Ltd., Toronto, Canada.* (Parenthetical query on Exhibit No. 4. Oh, well, when apostles of peace like Mr. Brockway and the others try to scare people into becoming pacific why be even parenthetic?) Mr. Brockway's conclusion is absurd. It follows just as logically that the drop in sales of chewing tobacco during the world-wide depression was due to fickle masculine taste. The brothers of the quid know better than that. What goes for chewing tobacco goes just as well for firearms.

THESE exhibits, as absurd as they are, are inserted in the record not that they are of any consequence but merely to express the hope that all these exhibitors may eventually renounce their own pink nonsense now that Professor Einstein's collision with reality has shown the way to good sense. The Professor has demonstrated that he can't have his cake and eat it, that when everything is rosy it is easy enough to be foolishly inclined about the hard realities of the one planet we really know something about. His erstwhile pacifistic confreres would do well to revise their twaddle now. It must be a bit embarrassing to have to do it after the shoe has begun to pinch.

So we come to the apparently justifiable conclusion that pacifism is a relative thing. It is a song in which there is no discord when all is pacific; a symphony in which the brasses and woodwinds are noticeably discordant when the stern fist of reality bangs on the leader's desk. That is one of the strange things about it all. It is so bound-up with relativity that in time of peace the believers in national defense are called militarists and war lords when in reality they are the real pacifists. On the other hand the admitted pacifists are the real militarists. These latter are fighting tooth and nail against war, not realizing that those they call militarists stand for assured peace. But even relativity in this connection becomes abstruse so we had better leave it for the Professor to figure out. He has begun to see the light; possibly his example will now spur on his erstwhile cohorts to a realization that Einsteinian relativity is practical as well as theoretic.

How different is the position of the believer in adequate national defense. There is no relativity in his plan. He stands for a stern facing of the facts of life. He believes in not throwing human experience overboard. He feels, as much as he would like to feel otherwise, that nothing that has happened in the last fifteen years has changed human nature—that queer makeup which is what it is whether we like it or not. He hates war, its waste and its misery, and he never wants it. But he is never foolish enough to believe that pink nonsense like the exhibits above will prevent it. That is exactly where he parts company with relativity. He stands firm in the belief that after silly talk has gotten us into a muddle, as it always has, it is only the preparedness to defend that can get us out of it. Professional and amateur statesmen make wars; armies and navies unmake them. University presidents, teachers of history, authors of books and feature writers should know that or, if they really do not, then they might take the word of their former leader, the apostle of relativity, for it. Professor Einstein makes their way easier.

Association Affairs

AT this writing, plans for the fifteenth annual meeting of the Association are progressing rapidly. The meeting will be held under the auspices of the Pittsburgh Post in the city of Pittsburgh on either the second or third Thursday in November. An invitation has been extended to Hon. George H. Dern, the Secretary of War, to be the principal guest speaker at the meeting and the actual decision as to the date is awaiting his pleasure. All members of the Association will receive personal invitations in due course.

The annual meeting in Pittsburgh will be held in place of the usual gathering at the Aberdeen Proving Ground. The executive committee of the officers and directors felt that in view of present conditions it would be advisable not to hold the meeting at the Proving Ground this year. The officials of the Pittsburgh Post having requested that the meeting be held in Pittsburgh the invitation was gladly accepted.

The fifteenth annual meeting will be a dinner gathering at the Duquesne Club. Other distinguished guests in addition to the Secretary of War will attend and a large following of industrialists and engineers of the Pittsburgh area have already signified their intention to be present. Complete details will be furnished all members as soon as the date is determined upon which should be before October 20th.

COL. HARRY SCULLIN, Aux. Res., Assistant Chief of the St. Louis Ordnance District, has taken a hand in the operation of the public works administration. He is one of three members of the Advisory Board appointed for the State of Missouri. The function of these boards, according to the public works administrator who has urged quick action on useful public projects, is to provide employment of large numbers of men in the shortest possible time. Carrying out these instructions the advisory boards are to proceed immediately in selecting for submission to the administrator a balanced program which will move men from relief rolls to pay rolls.

Col. Harry Scullin

Colonel Scullin, who has served on the Board of Directors of the Army Ordnance Association since 1927, is well known in national ordnance affairs as he is in many public enterprises in his native state. Always an energetic advocate of naval and military preparedness as a policy of the Federal Government, Colonel Scullin has an enviable record for the national defense. As head of the Scullin Steel Company of St. Louis he is familiar with the problem of munitions production and has given untiringly of his time and ability to the solution of that problem. This he has done in a very notable way in his capacity as Assistant Chief of the St. Louis Ordnance District and as President of the St. Louis Post of the Army Ordnance Association. Coincident with his appointment to the public works board he was named at the same time by Mayor Dickmann of St. Louis chairman of a temporary committee to effect preliminary steps toward a campaign of education and organization along the lines of the national movement to speed the return of prosperity under the National Recovery Administration.

Born at Fort Leavenworth, Kansas, October 6, 1867, Colonel Scullin was educated at St. Louis University, St. Louis, Mo., and at Fordham University, New York. His important private and public service includes: Operation as general manager of 100 miles of street railway in St. Louis, and president of several affiliated companies, 1888-1898; president, Scullin Steel Company since 1898; president, Citizen's Bridge Committee, St. Louis, 1923-1928; vice-chairman, Bond Supervisory Committee which directed the expenditure of $87,000,000 for improvements in St. Louis, 1923-1933; chairman of the board of the Merchants and Manufacturers Association of St. Louis since 1920; member St. Louis Airport Commission; director, First National Bank and St. Louis Union Trust Company. Colonel Scullin was commissioned in the Ordnance Reserve in February, 1927, and was appointed Assistant Chief of the St. Louis Ordnance District in the following month.

SUPPLEMENTING the names of individuals who have been active in ordnance affairs and who are now assisting in the administration of the economic recovery acts, all members of the Army Ordnance Association will extend felicitations to Mr. George N. Peek, head of the Agricultural Adjustment Administration. He has been active in ordnance affairs for many years and is a charter member of the Association.

George N. Peek

Mr. Peek served as a member of the War Industries Board from 1917 to 1919. He was vice-president of Deere and Company of Moline, Ill., from 1911 to 1919 and president and general manager of the Moline Plow Company from 1919 to 1923. His experience and standing as a manufacturer of farm implements and the proximity of these enterprises (and we surmise his membership in the Rock Island Arsenal Golf Club) to the Rock Island Arsenal developed a close contact with that ordnance establishment and its personnel.

Mr. Peek was born at Polo, Ill., in 1873 and spent his youth at Oregon, Ill., a short distance from his birthplace. Here he first became acquainted with Frank O. Lowdon who was destined to become governor of the state. Since 1921 he has been working actively for farm relief. His attitude toward the farm problem was clearly set forth in January, 1922, before the National Agricultural Conference, where he urged the Federal Government to "take such steps as will immediately re-establish a fair exchange value for all farm products with that of other commodities." It was in that year that he and his general counsel and business associate, Gen. Hugh S. Johnson, wrote and published a booklet entitled "Equality for Agriculture." He was elected president of the American Council of Agriculture in 1924 when he discontinued his major business activities as a manufacturer of farm implements to devote his time to the solution of agricultural problems. He was one of the group of Middle West industrialists who in 1929 organized National Corn Stock Processes, Inc., for the commercial development of the processes and patents resulting from research studies in Iowa State College on farm wastes, particularly corn stocks.

For his war service Mr. Peek was awarded the Distinguished Service Medal and he has also been decorated with the order of Chevalier Legion of Honor by the French Government, Com-

mander Order of the Crown, Belgium, and Knight of the Crown, Italy.

WHEN the NRA started drafting its personnel for key positions in the task of mobilizing industry in double-quick time it hit closest to home when Maj. Charles R. Baxter, formerly executive secretary of the Army Ordnance Association and editor of ARMY ORDNANCE, was called into the administration's service.

Maj. Chas. R. Baxter

Major Baxter is an assistant to Maj. Gen. C. C. Williams, deputy administrator of the NRA, a director of the Association and former Chief of Ordnance of the Army. Major Baxter has held many important assignments in the Ordnance Department. For the three years during which he was executive secretary of the Association and editor of this Journal he brought the membership to its highest point and the finances of the organization to a condition which has contributed very materially to efficiency and permanence.

Born in Missouri, Major Baxter was appointed to the United States Military Academy from Colorado and after his graduation with the class of 1911 was commissioned a second lieutenant in the Coast Artillery Corps. He served at Fort Monroe, Fort Baker and Fort Kamehameha until 1915 when he was detailed to the Ordnance Department in the grade of first lieutenant. From January, 1916, to June, 1918, he was stationed at the Rock Island Arsenal where he was in charge of the equipment shops and also served as a member of the Wood Utilization Committee of the War Industries Board. From June of that year until February, 1919, he was in charge of the building of the Savanna Proving Ground, Savanna, Ill. He was then transferred to the Office of the Chief of Ordnance where he was placed in charge of the construction and facilities branch of the Field Service and for a time served as chairman of the Ordnance Salvage Board. In September, 1924, he was detailed to the Harvard University where he pursued the course in business administration. He was graduated in 1926 with the degree of Master in Business Administration. He then returned to the Office of the Chief of Ordnance as fiscal officer and as executive assistant to General Williams. During this tour of duty Major Baxter occupied the editorial desk of ARMY ORDNANCE with its joint duties of secretary of the Association. In July, 1930, he was sent to the Frankford Arsenal, Philadelphia, Pa., where he assumed charge of the Instrument Department and later the Artillery Ammunition Department and the War Plans Section. In July he was placed on detached service for temporary duty with the NRA.

All members of the Association who have come in contact with the jovial and capable "Fatty" Baxter will agree that his emergency service with the NRA has made available to the forces operating under the Blue Eagle an energetic and competent official. His many friends will join in congratulations and well wishes to him.

ANOTHER member of the Army Ordnance Association who joined the ranks of the National Recovery Administration in the role of an assistant deputy administrator is Lieut. Col. George Stuart Brady, Ord. Res. Colonel Brady is a charter member of the Army Ordnance Association and a frequent contributor to this Journal. His latest article, "War and Peace in the Machine Age" appears on page 71 of this issue.

Colonel Brady was born at Bridgeport, Conn., in 1887 and is a graduate of the Sheffield Scientific School of Yale University where he received his Ph.D. degree. He has had varied experience as an executive with the Union Typewriter Company and the Royal Typewriter Company, the Victor Talking Machine Company and the Winchester Repeating Arms Company. He was commissioned a captain in the Ordnance Department of the Army in September, 1917, and sailed for foreign service in May of 1918. He served on the staff of Col. Charles M. Wesson, Ord. Dept., at Mehun-sur-Yèvre. For his especially meritorious and conspicuous service he was cited by the Chief Ordnance Officer of the A. E. F. Following his return to the United States in July, 1919, he was attached to the United States Embassy as American Trade Commissioner to the Argentine. Later he became editor of *Product Engineering*. Colonel Brady was a consultant engineer in New York City prior to his service with the NRA.

COL. ROBERT P. LAMONT, a life member of the Army Ordnance Association and a director since the establishment of the Association in 1919, has resigned as President of the American Iron and Steel Institute. He accepted the presidency of the Institute in August, 1932, following his resignation as Secretary of Commerce in the Cabinet of President Hoover.

Colonel Lamont occupied one of the most important offices in the Ordnance Department during the World War when he was Chief of the Procurement Division. Under his direction the vast purchasing program to meet the requirements of the American forces overseas was handled with such efficiency and skill that it merited the acclaim of all those who served under him as well as those who are familiar with the ordnance record in the World War. For his war service he was awarded the Army Ordnance Association Medal of Merit in 1931.

Identified with many business enterprises, he is probably best known in private life for his industrial achievement in handling the affairs of the American Steel Foundries, of which company he served as first vice-president from 1905 to 1912 and as president from 1912 to 1929.

THE St. Louis Post of the Army Ordnance Association gave a farewell luncheon for Col. E. D. Campbell, Ord. Res., at the Missouri Athletic Association on August 30, 1933. The occasion for the luncheon was the transfer of Colonel Campbell from St. Louis, Mo., to Berwick, Penna. He has just recently been promoted from chief engineer of the western division of the American Car and Foundry Company to chief engineer of the entire company, and in that capacity it was necessary for him to move to Berwick where the main offices of the company are located. Colonel Campbell is vice-president of the St. Louis Post of the Army Ordnance Association, being one of the Post's charter members. He has always maintained a lively interest in the affairs of the organization.

Col. Harry Scullin, president of the local post, was toastmaster at the luncheon and introduced as speakers a number of men prominent in the industrial and financial affairs of St. Louis. Capt. L. J. Dillon, Ord. Dept., U. S. Army, secretary of the post, presented Colonel Campbell with a desk set as a farewell gift from those attending the luncheon.

COL. JOHN O. JOHNSON, Ord. Res., chairman of the American Gage Design Committee and formerly chief of the Gage Division of the Ordnance Department and member of the National Screw Thread Commission, has resumed his consulting engineering practice and has established offices for industrial mechanical engineering service in Washington. Colonel Johnson is well known to the machine tool and gage industry having been identified with it for many years. He entered the Ordnance Department after the World War when the gage situation resulting from those days was in a particularly disorganized state. Under his guidance as chief of the Gage Division the vast supply of gages required for ordnance was speedily catalogued and stored and in addition he coöperated in the design of post-war ordnance

particularly in its application to gage requirements. Colonel Johnson is a charter member of the Army Ordnance Association and an active member of the Washington Post.

THE Army Ordnance Association lost one of its most active charter members and the Ordnance Department of the Army one of its most capable officers in the tragic death of Major Charles A. Schimelfenig who with Mrs. Schimelfenig was instantly killed by a speeding automobile at Troy, N. Y., on September 10th.

Major Schimelfenig was a native of Iowa and was appointed to the United States Military Academy from that state. He was graduated in the class of 1913 and prior to his service in the Ordnance Department which began in 1915 he served as a second lieutenant in the Coast Artillery Corps. He received his A.B. degree from Simpson College, Iowa, was a graduate of the Army Industrial College, class of 1925 and an honor graduate of the Command and General Staff School, 1926. He served at the Rock Island Arsenal during the early days of the World War when he had charge of the harness shop. In April, 1918, he was transferred to the Supply Division, Office of the Chief of Ordnance, and later was head of the Equipment Section of the Engineering Division.

Major Schimelfenig sailed for duty with the American Expeditionary Forces in France in October, 1918, and served as Ordnance Officer of the 7th Army Corps. He was also with the American Forces in Germany as commanding officer of the Ordnance Repair Shops until April, 1921. Upon his return to this country he became chief of the Maintenance Division, Field Service, until October, 1923, when he was assigned to the Equipment Branch G-4 of the General Staff. Following his graduation from the Command and General Staff School in 1925 he was Assistant to the Director of Purchases in the Office of the Assistant Secretary of War until September, 1930, when he was placed in charge of the engineering department and the war plans section of the Watervliet Arsenal.

The bearer of a name already distinguished in American military history, Major Schimelfenig by his service in the Army and especially his unusual achievements in positions of high responsibility in the Ordnance Department added luster to the name. He was a frequent contributor to the pages of ARMY ORDNANCE as a member of the book review staff where his scholarly attainments were always apparent though the authorship was unknown to the reader.

MR. JAMES A. CAMPBELL, a member of the Cleveland Ordnance District Advisory Board and chairman emeritus of the Youngstown Sheet and Tube Company, died at his home in Youngstown, Ohio, September 20th. Born in Ohltown September 11, 1854, Mr. Campbell began his career, which was to rival those of other industrial leaders who have achieved fame, as a clerk in the employ of a local coal company. He rose to become one of the nation's experts in the steel tube manufacturing industry, a director and former vice-president of the American Iron and Steel Institute and for three decades a national figure in the steel industry. His name shares the great success achieved by his fellow leaders of the steel industry, Messrs. Carnegie and Schwab. Mr. Carnegie created the foundation for the United States Steel Corporation; Mr. Schwab united the remaining forces of the East to form the Bethlehem Steel Corporation and Mr. Campbell performed the same service and reared a towering independent for the midwest.

The Youngstown Iron, Sheet and Tube Company was formed by Mr. Campbell in 1901 when he was elected vice-president and general manager succeeding to the presidency in 1904. With Mr. Samuel Mather, late of Cleveland, Mr. Campbell became a dominant figure in steel affairs both in the Mahoning Valley and throughout the country.

Typical of Mr. Campbell's interest in public affairs was his service on the Advisory Board of the Cleveland Ordnance District. He brought to that group a fund of practical counsel and advice and with his confreres of that organization was instrumental in developing the munitions preparedness possibilities of the area to their present commendable state.

THE death, on September 2, 1933, of Maj. Thomas M. Chance, widely known engineer of Philadelphia and a charter member of the A. O. A., removes from the roster of the Philadelphia Post of the Association the name of one of its most zealous and active members. Major Chance was a business man of unusual executive capacity. He served during the World War as an officer of the Chemical Warfare Service having been commissioned as a captain, later being promoted to the rank of major.

He was a member of the firm of H. M. Chance and Company of Philadelphia. He was the inventor of the sand floatation process for cleaning coal, a method which he developed and brought to practical use during the last ten years of his life. This process has been steadily growing in popularity and is now used in the anthracite regions by plants giving employment directly and indirectly to about 25,000 miners and other employees. Major Chance devoted his energies wholeheartedly to furthering the adoption of this process, and in the minds of his intimate friends the intensity of his application doubtless shortened his life by many years. He will be missed when members of the Association gather especially by his ordnance confreres of the Philadelphia district where he was a constant and valued helpmate.

THE following have been admitted to membership in the Army Ordnance Association since the last issue of ARMY ORDNANCE: Burnham Adams, Paterson, N. J.; Francis W. Breuil, Rhodesdale, Md.; K. R. Crosher, Weches, Texas; F. Theodore Dexter, Topeka, Kans.; Robert J. Kelly, Darien, Conn.; Charles H. Kindle, Washington, D. C.; Albert B. Moore, Troy, N. Y.; Harry C. Moorhead, Wallingford, Conn.; Anthony J. Rudgers, Long Island City, N. Y.; George M. Searle, Troy, N. Y.; Charles R. Strong, Ardmore, Pa.; P. E. Tyler, Belleville, Kans.

SINCE publication of the last issue of ARMY ORDNANCE notice has been received of the death of the following members of the Association: H. L. King, King's Mills, Ohio; George A. Lutz, New York, N. Y.; Max Solomon, Pittsburgh, Pa.; and William Tyacke, Orange, N. J. To relatives and friends of these deceased members ARMY ORDNANCE extends condolences.

THE Constitution of the Army Ordnance Association contains the following provisions in respect of membership in the organization:

"Sec. 1. Full membership in the Association shall be open to all men who are American citizens and who are interested in promoting the cause of industrial preparedness, particularly in connection with the design, procurement, production, manufacture, inspection, test or supply of Ordnance material.

"Sec. 2. Life membership in the Association shall be open to all men who are American citizens and who are interested in promoting the cause of industrial preparedness, particularly in connection with the design, procurement, production, manufacture, inspection, test or supply of Ordnance material.

"Life membership shall continue during the lifetime of the life member and shall expire at death. It shall not be transferable.

"Sec. 3. Student membership in the Association shall be open to all men who are American citizens and who are students in technical schools or colleges. Student members shall not vote or hold office in the Association.

"Sec. 4. Group membership in the Association shall be open to all individuals, firms, companies and groups controlled by American citizens who are interested in promoting the cause of industrial preparedness, particularly in connection with the design, procurement, production, manufacture, inspection, test or supply of Ordnance material."

Letters to the Editor

Aggression and Aggressive Weapons

The Editor:

General Fuller's article in the July-August issue is especially deserving of praise. Probably not all readers will agree with his justifying offensive operations against civilians, which begins with the second paragraph on page 11. This should be considered in connection with an article by James E. Mills, entitled "Chemical Warfare," which appeared in the April, 1932, number of the quarterly review *Foreign Affairs* (New York) and was reprinted in the July, 1933, number of *Chemical Warfare*. Mills discusses the demand for the suppression of the newer and more efficient weapons on account of their possible use against civilians. He argues that since certain and complete evacuation of the civilian population of a city could be compelled by the use of tear gas alone, there is no military necessity for the use of lethal gas against civilian populations, and that the principal safeguard of civilian populations appears to be that primordial rule that the operations of war between civilized peoples must be limited to the armed forces alone.

After all, why should not the same factor deter the use of lethal gas against civilians which deters the use of, say, the machine gun against them: namely, the fear of alienating world opinion, and the fear of "the harshest and most justifiable reprisals"? The two weapons are alike in being extremely efficient.

It is indeed absurd, as General Fuller points out, to ban an efficient lethal weapon because it is efficient and not because it is lethal. Yet is there any more occasion for using a weapon against civilians, just because it is efficient? General Fuller does indeed state a good case for such use. However, is not the case for such weapons, as a whole, weakened when we support it by the two conflicting arguments: first, that these weapons will not be used against civilians; second, that they ought to be used against civilians?

The public reaction is likely to be that we "got our signals mixed." One can only wish that the two authors had "got together" first, and hope that the two different points of view revealed may soon be harmonized.

C. G. Dunkle.

Dover, N. J.

Ancient Cycle of War

The Editor:

In the May-June, 1933, number you published a letter by Lieut. Col. George S. Brady, Ord. Res., covering an entire page and attacking my "Ancient Cycle of War" which appeared in the March-April number. Your correspondent refers to my quotation from Saint Jerome as "the words attributed . . . to Saint Jerome," thereby implying that I made up the quotation. Further on, borrowing the good old phrase of Henry Ford in regard to all history, he writes "The idea of Captain Nickerson that an army of 150,000 men defended the empire is the bunk, and has no foundation in any history." Nor has it any foundation in my article; had he read that article with just a little more attention he would have seen that the figure 150,000 is merely that of the heavy legionary infantry of the Roman army as reorganized by Augustus. Further he would have seen: (a) that this figure was obtained by estimating Augustus' legions at 6,000 men, exactly the number which he belligerently defends! (b) He has entirely missed the facts stated by me that the Roman Auxiliaries were as numerous as the legionaries, that after a time the increased barbarian pressure necessitated an increase in numbers, and that other causes beside the plague of wars between 431 and 31 B. C. helped to degrade the Greek city states and the Roman Republic. Really, Mr. Editor, it would seem desirable that before attacking published work people should study that work a little.

If Colonel Brady wishes to disagree with the unanimous opinion of today, which is that an overdose of war is bad for a civilization, then he is welcome to his loneliness. Some of his figures for barbarian recruitment in the Roman army look very doubtful to me; if he will state his authorities I will be glad to examine them. If by some notable and startling bit of historical research he has discovered that a "legion" could be 40,000 strong and composed of Germans and Quadi, he owes us some light on this point; it is a piece of elementary historical scholarship that legionaries were supposed to be Roman citizens and that the maximum strength of a legion was fixed. A little more study of the army reforms of Diocletian and Constantine would have shown him that they reduced not the strength of all legions but only those of their new Field Armies, leaving the border legions untouched. Furthermore the reduction was not to 1,500 as he says, but to 1,000. Most of his historical commonplaces about the ancient world are irrelevant to my article and therefore need no consideration here.

Hoffman Nickerson.

Oyster Bay, N. Y.

Hedgehopper Defense

The Editor:

I think it would be a fine thing if Army Ordnance would publish more frequently articles like "Defense Against the Hedgehopper," the symposium which appeared in the July-August, 1933, issue. I am a lay reader of your publication hence I do not have the required familiarity with tactical questions such as those raised in this symposium. Neither do my professional pursuits bring me in close enough contact with military engineering to enable me to reach conclusions accurate enough to be called final. Because of this I find the analyses presented by Majors Eastham, Woodberry and Hibbs to be of especial value in that they acquaint the layman with important military problems and stimulate thought which may be of some value some day. I heartily approve of such discussions for their insight into difficult military questions. When all of us, qualified and unqualified, get to thinking about such things something worthwhile is sure to come out of it.

The conclusions presented by the several contributors to the symposium strike me as being excellent. However, as I see it, the problem is far from solved. Surely this menace of open warfare, the hedgehopper, must eventually have a more dependable mechanical defense than is indicated in the symposium. I understand, of course, that the problem is new and that the answer is being worked out. It would be most enlightening to know the answer as our own Air Corps must have it in mind and, more to the point, what other more definite steps are available in the minds of ordnance engineers. The machine gun mounted over the hood of a truck impresses me as the most effective means of beating off the hedgehopper from the column on the march. But why not an armored vehicle instead of the vulnerable truck? The menace of the hedgehopper, once he has "broken through" would seem to demand a new defensive vehicle in the equipment of the column, a veritable moving fortress to go with the column just as the mother ship goes with her flock of submarines. I should imagine that the great things already done by the Ordnance Department in developing antiaircraft guns, fire control and combat cars, would find its full expression in a combination of these elements to give a degree of protection much more certain than is indicated. I believe all readers of your valuable Journal will await, as I do, further comment from qualified sources.

Washington, D. C. Ben Fuller.

Professional Notes

STANDARDIZATION OF SURFACE QUALITIES

NEWS of particular interest to Ordnance engineers both in government and industry is contained in an announcement of the American Standards Association of the appointment of personnel to serve on the sectional committee on Standardization of Classification and Designation of Surface Qualities. The committee will be under the chairmanship of Lieut. Col. Charles G. Mettler, Commanding Officer of the Augusta Arsenal and formerly executive officer of the New York Ordnance District. Members of the committee have been selected from the various industries and professions and number among them many of the leaders in their respective branches of engineering.

The project to be undertaken by the committee has for its scope the classification and designation of surfaces according to quality of surface—a subject of extreme importance in the standardization of ordnance practice. It is safe to say that no phase of standardization work has a more important relationship to ordnance than the work to be undertaken and directed by this committee. Surface finishes and qualities and their standardization are so vital to the proper functioning and quantity production of American munitions that it is encouraging to have this additional evidence of the close coöperation which exists between the War Department and the two founder engineering societies which are sponsors of the committee as well as the American Standards Association itself. Everyone who experienced the difficulties arising from the lack of accepted standards practices during the World War will agree that standardization is at the very foundation of successful industrial mobilization.

Likewise it should be said that under the guidance of Maj. William B. Hardigg, Ord. Dept., U. S. Army, of the Planning Branch, Office of the Assistant Secretary of War and secretary of the General Munitions Board, standardization of war requirements has been fostered and developed to a high state of efficiency.

USE OF WELDING

THE new stream-lined railroad trains will make use of welded construction, a subject in which all students of modern ordnance are intimately concerned. The utilization of welding on the design of our larger gun carriages is well known to readers of this Journal. It is another case where the metallurgy of peace has been significantly advanced by the researches and applications of the Ordnance Department of the Army. The latest application of arc-welded rolled steel construction is contained in the announcement that this type of fabrication will be used in the engine structure which will power the new 110 m. p. h. lightweight passenger train of the Union Pacific System.

The engine parts to be built by welding consist of the engine frame proper, the oil pan and twelve cylinder heads. The engine will be a V-type, twin six unit, direct-coupled to a generator, which in turn will supply power to the driving motors and thence to the axles.

The highly-stressed engine frame proper will be constructed of a new high strength alloy steel, welded by a new welding technique which deposits weld metal with characteristics equal to the high strength base metal. The entire engine frame will be subjected to a radiographic examination by means of radium as an inspection check to insure the quality of the welds. The new high strength alloy steel, and the new welding technique, have amply demonstrated, on the test block, their ability to withstand the severe service to which the engine structure will be subjected.

SYMPOSIUM ON MOTOR LUBRICANTS

SEVEN technical papers and extensive discussion comprise the published Symposium on Motor Lubricants recently gotten out by the American Society for Testing Materials. The papers were presented at a joint meeting of the A. S. T. M. and the Metropolitan Section of the Society of Automotive Engineers. The symposium was arranged by A. S. T. M. Committee *D-2* on Petroleum Products and Lubricants. Subjects covered include: service requirements, viscosity, carbon deposits, oil consumption, service changes, engine design as affecting oil performance, etc.

The paper on "Carbon Deposits in Gasoline Engines" presents a review of available data on this problem, particular attention being given to the influence of lubricating oils on deposits. Several tests which have been proposed to predict carbon-depositing tendencies of oils are critically discussed. The relation of the A. S. T. M. pour test to service requirements of oils is outlined in another paper, while a third presentation covers the factors involved in the relationship between viscosity limits of crankcase lubricants and service requirements. A review of the existing data on changes which crankcase oils undergo during service is presented. There is considerable discussion of this paper included in the printed symposium. The paper on "Oil Consumption in Motor Car Engines" correlates recent findings on consumption of oil and discusses the more important conclusions resulting therefrom. The effects of engine speed, engine design and oil properties are outlined and conclusions are presented based on motor dynamometer, chasis dynamometer and road tests.

Other topics discussed in the symposium are "Factors in Engine Design which Affect Oil Performance" and "Aircraft Engine Lubrication." This latter paper is confined entirely to the practical application of available oils in aircraft engines and the problems encountered.

Many of the problems discussed in the symposium are controversial ones and the participation in the discussion by outstanding technologists in the petroleum and automotive industry resulted in a general advancement toward agreement on some of these factors.

The authors have used diagrams and tables extensively to give a quick and clear presentation of data. The symposium covers 121 pages. Copies are available in heavy paper binding at $1.25 or in cloth binding at $1.50 from the A. S. T. M., 1315 Spruce Street, Philadelphia, Pa.

NICKEL CAST IRON DATA

THE rapid progress which has been made with the help of alloys in the production of surprisingly superior cast iron for numerous applications is fully described in bulletins on nickel cast iron, nickel chromium cast iron and Ni-hard recently published by the International Nickel Company. These bulletins are of particular value to engineers and industrialists in the use of gray or chilled cast iron. Alloyed cast irons have been adopted with such consistent success that their development parallels the early history of alloy steels. To name only one of the revolutionary applications being considered for the approved material, who would have thought ten years ago of using cast iron for such highly stressed parts as automotive crank shafts?

These bulletins, which are additions to the series, started with the release of Section 1, Number 1, "Guide to the Selection of Engineering Specifications for Gray Cast Iron," are as follows: Section 3, Number 1, which covers nickel cast iron and nickel-chromium cast iron and Section 3, Number 2, which relates to Ni-hard and other nickel chromium, chilled, wholly white or partly white cast iron for applications requiring exceptional hardness, toughness, wear resistance and strength. The contents were originally prepared for the American Society for Steel Treating—"National Metals Handbook" by Dr. Paul D. Merica, assistant to the president of the International Nickel Company.

Additions to this series will be released from time to time

and a binder to facilitate filing is under consideration by the company. Readers of this Journal who desire to obtain copies of these and other bulletins in the series may do so by applying to the company at 67 Wall Street, New York, N. Y.

Ordnance Department Notes

FROM time to time various objections have been raised to the present form of Adjusted Compensation Contract for use in war time procurement, which seem to show that serious difficulties may arise unless variations in it are allowed to fit the widely different conditions under which its use is planned. Conclusions and recommendations of a board of officers in the Bridgeport Ordnance District have been circulated to the other ordnance districts. It is hoped that when the comments of the district chiefs are laid before the board of officers appointed for the purpose of standardizing the form of war contracts that certain alternate forms or paragraphs may be approved which may at least alleviate the apparent unsatisfactory applications of the present form.

The Assistant Secretary of War has designated the Rochester Ordnance District as the contact office with the General Electric Company for procurement and industrial planning, in accordance with the wishes of the company and the recommendation of the Ordnance Department. This is seen as a correct method of decentralization. The Assistant Secretary reserves the right to approve all schedules of production and the war time use that will be made of this company's production, while encouraging progress in the necessary planning in accordance with the company's desires.

A preliminary report has been prepared by the Picatinny Arsenal on the tests of "Ampco" non-sparking tools. This material is superior for special uses where the wear on copper or brass tools now used is so excessive as to warrant the purchase of this harder material.

THIRTEEN HUNDRED AND FIFTY Browning machine guns, caliber .30, Model 1917, are being modified at the Springfield Armory so as to convert them into a like number of U. S. machine guns, caliber .22, M1. Fifty of the new M1 machine guns are for issue to the U. S. Marine Corps, 100 are for National Guard Bureau, and 1,200 are for issue to the Regular Army. The above guns will be available for issue to the using services about July 1, 1934. Pilot models of the U. S. machine gun, caliber .22, M1, have been tested by the Infantry, Cavalry and Coast Artillery Boards under the nomenclature of "T1" and all have recommended adoption.

A similar order has recently been placed at Springfield for the manufacture of 1,500 U. S. Rifles, caliber .22, M2, for issue to the Regular Army. These rifles will be ready for distribution in the late spring of 1934. It is contemplated increasing the authorized issue of caliber .22 rifles from five to ten per Infantry and Cavalry organization.

A method has been devised and approved for exercising major caliber harbor defense and railway matériel supplementary to actual firing. The method provides suitable air valves whereby after the tipping parts have been elevated to maximum elevation, the air in the recuperators is released thus allowing the gun to slide back to fully recoiled position. After inspection of rods, packing, etc., the recuperator is refilled with air from air bottles and the gun brought back to battery position. This method is not intended to supplant exercising by firings but is supplemental thereto and will be used where firings are not practicable. Instructions for its use are being prepared for issue.

ORDNANCE patents recently issued include: To Harry A. Knox, No. 1,923,099, for a track for track-laying vehicles. The main object of the invention is to provide a light rubber jointed track.

No. 1,920,082 to Capt. Hiram B. Ely, for fire-control apparatus. This invention furnishes a novel method of incorporating in the time of flight mechanism a provision for consideration of the speed of the target and its angle of approach so that the present time of flight used as a multiplier becomes a fictitious time of flight which corrects for the fact that the observed rate of angular travel is not constant during the time of flight.

To Maj. Edward H. Murphy No. 1,920,296 for a packing unit, a simple form of the labyrinth type.

No. 1,920,984 to Forrest K. Howard, for a reversible feed mechanism for machine guns. This invention provides a two-way bolt with a switch so formed that the sides of the switch, in either position, aid in retaining the switch against turning.

No. 1,920,259 to Capt. Albert M. Jackson, for a method of determining and measuring distances. This invention is intended primarily for spotting aerial bursts with relation to aircraft and consists in utilizing two motion picture cameras, one at each end of a known base line, with the shutters synchronized and means for producing a time record on the film.

To Lieut. William F. Kellotat No. 1,924,159 for automatic firing action for guns. This invention consists in changing the firing mechanism of a Browning pistol so as to permit automatic firing when desired.

To Harry A. Knox No. 1,924,161 for a flexible track which provides a light flexible, easily repaired track for track-laying vehicles.

Our Treaty Navy

IMPORTANT observations bearing on the state of our national defense were made by Acting Secretary of the Navy, Henry L. Roosevelt, in an address over a national radio network on September 19th. The Acting Secretary replied to criticisms from abroad of the United States Navy building program as being harmful to the success of the Geneva Disarmament Conference. Colonel Roosevelt's explanation is so logical and timely that we republish a portion of the address here for the information of readers:

"One hears criticisms of our present Naval building policy," he said. "We are told that it is of paramount importance to the success of the Limitation of Arms Conference at Geneva to postpone the building of certain of the projected ships. We are warned that our building program might set a bad example to the other naval powers and might encourage another naval race. How unjustified is this assertion can be seen from the fact that by 1936 when our new program is completed we shall still be 101 vessels short of our authorized strength, Great Britain will be 64 ships short and Japan will have in commission its full quota."

"I wish to lay especial emphasis," Mr. Roosevelt declared, "upon the value of the Navy as a protection against air raids because of the absurd efforts which have been made to persuade the country that the advent of air power has made navies obsolete.

"The truth is exactly opposite. The new menace from the air makes our Navy more indispensable than ever.

"This is true because any serious air attack against us must first come in ships to within striking distance of our coast—certainly to within a thousand miles. Only the Navy can defeat or drive off the ships which might bring the planes, together with their large supplies of fuel, bombs, etc., and if the Navy does this we will be spared the devastation of air raids.

"There is a popular misconception that airplanes can fly across the ocean with a warload of bombs and other fighting equipment. This is not now possible nor even probable in the near future. In order to cross the ocean by air a plane must strip itself of the warload and carry gasoline in its place.

"The Washington Treaty, as well as the London Treaty, set the ratio of naval strength for the United States, Great Britain and Japan as 5-5-3," the Acting Secretary said. "What have we done to meet the obligations imposed upon us by these solemn treaties? In the hope that all nations, having come to the realization of the horrors of war, would do likewise we have slowed down our Navy building program to a dangerous point, but at the same time those nations less prosperous than ourselves have continued to build at a reasonable rate ships that from a purely

financial point of view they could ill-afford. They have realized that an adequate Navy is the insurance necessary to their national existence.

"Thus during the ten years since the Washington Treaty—a period of our greatest national prosperity—we failed to maintain our allotted position in sea power while other nations, less prosperous, were forging ahead with a well-defined building program. . . .

"This is the situation with which we were faced on March 4th. To correct this defect in our national defense, there has been set aside from the three billion three hundred million dollars allocated for the relief of unemployment, the sum of two hundred and thirty-eight million dollars to be spent in new naval construction. Through this allotment the two outstanding needs of our country at the present moment, namely, protection and employment, were linked together.

"An efficient and effective Navy is a team made up of many players," Mr. Roosevelt said later. "These players are fleet units such as a Division of Battleships, a Squadron of Destroyers or Submarines, an Aircraft Carrier with its planes, or a line of Cruiser Scouts. In battle each player has its particular function. None can be missing without greatly weakening the team. These players are drilled individually and collectively. Individually as divisions or squadrons they learn to shoot their big guns, fire their torpedoes or launch their planes. Collectively, during the war games, they learn their particular functions with the team. They strive for such coördination that each player acts his particular part at exactly the proper moment.

"To maintain such a team we need ships, we need repair yards to keep them in perfect condition, we need highly technical and experienced officers and we need men—the average run of American lads bright and courageous. We need them in sufficient numbers to man all stations at the same time. Your ship is also a team and this little team misses the absence of a man from a battle station as much as the big navy team misses a ship. We must have the Navy up to strength in personnel at all times and we must keep that personnel in training. The youth of our Country will respond in numbers in the event of a national emergency and can be trained as fairly good infantrymen in three months, but it takes years to turn out an efficient sailorman, capable of properly handling the highly technical instruments of a modern man-of-war. He must be trained in time of peace or he can't make the team in time of war.

"A navy cannot be improvised. The ships must be carefully built; the personnel carefully and intensively trained and the building of ships and training of men can only be done in times of peace. After war is declared it is too late. We must, therefore, build our ships and train our men NOW so as to provide the insurance to our Country that our people expect and have a right to demand."

While modernization of the United States Army is not a subject covered by treaty, practically the same reasons apply to it as to the Navy. Our first line of defense must be in readiness at all times and although an army is assumed to have a "breathing space" before actual hostilities arise, nevertheless the active portion of an army should be on a modern basis so far as its equipment is concerned. Colonel Roosevelt's splendid address we hope has proved the point for the Navy and by inference for Army motorization and mechanization also.

Machine Tool Orders

THE great need for machine tools, shop equipment and heavy machinery made necessary by the Navy building program has resulted in an allotment by the Federal Emergency Administration of Public Works of $2,100,000 for the immediate purchase of these supplies. Many of the tools now in use at the Navy yards and stations are obsolete and some of the shop equipment has passed the stage where it is useful or economical.

The tentative allotment to Navy yards and stations of funds for the purchase of tools and equipment is as follows: Portsmouth, N. H., $85,000; Boston, $69,000; New York, $185,000; Philadelphia, $140,000; Norfolk, $210,000; Charleston, S. C., $76,000; Mare Island, Calif., $240,000; Puget Sound, $271,000; Pearl Harbor, T. H., $75,000; Naval Air Station and Philadelphia Naval Aircraft Factory, $200,000; to Navy Yards for freight handling equipment, $50,000; for tools and repair ships and tenders, $220,000; and for tools for battleships, cruisers and destroyers, $279,000.

It is said by the Public Works Administration that these purchases will give employment to over 2,000 men in factories throughout the country for a period ranging up to a year.

Cuban Military and Naval Organization

THE latest figures contained in the *League of Nations Armaments Year-Book for 1933*, now being distributed in this country through the World Peace Foundation, Boston, are illuminating. They show, according to a recent issue of *The Army and Navy Journal*, that Cuba reported a total of 13,155 effectives and 867 officers in its army and 1,159 effectives and 153 officers in its navy.

The supreme command of the army is vested in the President of the republic who exercises his powers in time of peace through the secretariat of the army and navy and through the chief of staff. The island is divided into eight military areas.

There are four infantry battalions, each consisting of a staff, four companies, a machine-gun section and a horse-drawn train section. Each of the six regiments of cavalry has a staff, three squadrons, a machine-gun section and a horse-drawn train section. In the artillery there is one field artillery battery, two mountain artillery batteries and three coast artillery battalions. Each battalion of the coast artillery consists of a staff, four companies, a machine-gun section and a horse-drawn train section. The report on the air force gave 16 fighter, observation and training airplanes with a total horsepower of 5,590. In addition there are two companies of engineers and two signal service companies (telegraph, telephone and wireless).

Other organizations include the gendarmerie, rural guards and police. The gendarmerie forms part of the army and comprises 38 squadrons. The rural guards, a military organization employed in time of peace to maintain order and protect life and property, has a maximum establishment of 42 squadrons, numbering 4,657 privates. The national police are under the authority of the secretariat of the government and count 2,241 officials and agents.

Military service is compulsory for all citizens between the ages of 18 and 45 but lately in practice service has been voluntary with two-year enlistments. Enlisted men are retired at 58 years of age. Officers are obtained from the Cadet School at Moro, Havana, and from among the non-commissioned officers who have passed through the NCO school.

The military education system involves 14 types of schools. The cadet school at Moro trains for commissions. A practical training school for cavalry and infantry is maintained at Columbia for officers. A practical training school of artillery is maintained at Cabana for officers. Each battalion or district has a corporals' school and also a recruiting school. There is a garrison class in each military station. There is also an academy for NCO's and corporals. The flight training school is maintained at Columbia as is the veterinary and farriery school. At Havana there is a school for motor drivers and an armorers school. For the navy there is a naval academy, a naval school at Mariel and a school for naval mechanics.

The navy has two cruisers, the Cuba (1911), and the Patria (1911), the latter being a training ship. The Cuba is of 2,055 tons and measures 260 by 39 by 14 feet. It has a horse power of 6,000. Its guns comprise two 4-inch, six 3-inch, four 6-pounders, and four 3-pounders. The Patria displaces 1,200 tons and is 200 by 36 by 13 feet with a rated horse power of 4,000. Its guns consist of two 3-inch, four 6-pounders, and four 3-pounders. In addition there are gunboats, 13 units of a total tonnage of 2,425 tons, with guns of 3 inches, 2.24 inches and 1.46 inches.

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Book Reviews

HISTOIRE TECHNIQUE DE L'ARTILLERIE DE TERRE EN FRANCE PENDANT UN SIECLE (1816-1919). Tome Premier (1816-1880). Supplement Au *Memorial De L'Artillerie Francaise*. J. Challeat. General De Division (C. R.). Paris. Imprimerie Nationale. 1933.

THE French Artillery has recently had the good fortune to see started on its way a monumental study of its technical development from 1816 to 1919. Since the work is the result of the indefatigable research and skillful exposition of that well-known authority, General Challeat of the French Artillery, and is under the editorial supervision of the distinguished General Charbonnier, the excellence of the result could readily be anticipated. Three volumes will ultimately be required to contain the fruits of this useful investigation. The first volume which describes the technical development of the land artillery in France from 1816 to 1880 fully meets the high standard expected of this study.

General Challeat has determined to make his history of practical value to the younger generation of artillerymen. He maintains that a careful study of serious failures is as essential and valuable as the study of great successes. Technical theories and description of matériel are subordinated to a narrative in which "the men, the establishments, and the organizations will be represented in their ideas, their evolutions, their merits, and their faults." The reader will learn that progress has often commenced in the development of small arms and has finally extended to the domain of artillery matériel. The question of mobility and means of transportation is emphasized in its capital importance to the success of armies in the field.

The successive systems of artillery are adequately described, and the solutions of the never-ending search for increased mobility, lighter weights, greater ranges, greater accuracy, etc., by technicians of a century ago are full of instruction for the modern ordnance expert.

The first volume is a fascinating account of the highest development of the smooth-bore artillery and the subsequent adoption of rifled guns. The book is excellently printed, well illustrated, and is certainly a definitive account of the technical history of the French Artillery for the period concerned.

THE FIRST WORLD WAR. Edited by Laurence Stallings. New York: Simon and Schuster. 1933.

THIS is a very unusual book of pictures assembled after nearly three years of research work in Europe and America. They record the highlights and crucial situations of the World War. As photographs they are unusual in that they interpret in clearest terms the actions of mob psychology, the gruesomeness and pity of war as it is fought in the twentieth century. Mr. Stallings deserves credit for the selection and also for the captions which are his work. He claims to have been guided by no national partisanship, no specific pleading and no desire either to glorify or attack.

It is hard to say just what effect such a record as this will have. If the effect be to stimulate more absurd proposals to do away with war altogether, the result of this fine collection will not have been constructive. If, on the other hand, it brings home the destructiveness of life, limb and property in modern war and creates a keener realization that war is always an undesirable thing, then its effect will be laudable. Pictures are more con-

vincing than type. The conviction brought to this reviewer by gazing upon Mr. Stalling's collection of photographs is that it confirms the known fact that war of the twentieth century is not nearly as romantic as wars of earlier days. If loss of romanticism would prevent future major wars this book will have accomplished much. We doubt, however, that its effect will be quite so beneficial.

Of course it is unpleasant to see human misery as is depicted here. No one in the heat of war really desires the effects here shown; no one consciously wills their causes. But there are pictures and pictures. Mr. Stallings should have seen some photographs recently arrived from present-day war zones which it was this reviewer's misfortune to have seen. Barbarity since the dawn of human life on this planet has not produced anything more horrible or fiendish. And what conclusion is to be drawn? Only this—that rather our entire nation be wiped from the face of the earth than court similar fate for even one of our fellow citizens. If emotions such as this result in the mass phychology so vividly pictured in Mr. Stalling's collection the result may be had—but there are actual facts of today a thousand times worse.

REVOLUTION, 1776. By John H. Preston. New York: Harcourt, Brace and Company. 1933. $2.90.

MR. PRESTON'S story of the American Revolution is a faithful reflection of the age we live in. It is hard-boiled and cynical, and has a plentiful supply of sex and profanity. Idealism is notably absent. In the Revolution according to Mr. Preston there is hardly one intelligent act to be recounted, scarcely one completely honest or able man on either side of the conflict—that is, until about the middle of the book. Mr. Preston has an extraordinary change of heart somewhere in 1778 or 9. He begins to discover that after all Washington had qualities of leadership, that here and there a spark of honesty and unselfishness existed in the sorry scheme of things. There is throughout however, a conscious effort to combat the kindergarten conception of the spotless and competent patriot fighting the scum of the British Army. The author writes in the debunking tradition and the result must be considered as a first rate addition to revolutionary history, even if it violates all the canons and traditions of the art.

This book conjures up vivid pictures of the battles, marches, and camps, and leaves a lasting impression of the military events of those years. The politics, the difficulties of government, the economic problems, are scarcely touched. It is almost exclusively a story of the battles and leaders of the revolution. From the military point of view Mr. Preston might well be criticized for dealing too exclusively with tactical situations, and for minimizing discussion of the strategy that led to those engagements. The military student will also regret the lack of a single map to clarify the details of strategy and tactics. Nevertheless, there is abundant reason to welcome this book which will doubtless be widely read. It is a striking commentary on the evils of political interference with military leadership, of the sufferings and losses by reason of inadequate preparation and poor organization, and of the cowardice in action that necessarily occurs when untrained men meet a disciplined foe.

JULIUS CAESAR. By John Buchan. New York: D. Appleton and Company, 1932. $2.00.

BEFORE his death, Julius Caesar had an experience vouchsafed to few men on earth. He was the witness of his own deification, for in a temple of Rome there was set up a statue of Caesar inscribed "To the Unconquerable God," and through the streets of Rome his image was carried in the solemn procession of the gods. Now some biographers depict a Caesar whose elevation to Olympus is unquestionably sanctioned by his character and achievements. There are others just as strongly bent on

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proving that this idol had feet of clay, and they love to repeat the scandalous stories of Suetonius and other detractors. Mr. Buchan must be numbered rather with the first group, although it cannot be denied that he makes valiant efforts to be impartial in his judgments. In the limits of this short biography, whose brevity the reader will constantly regret, the author draws an unforgetable portrait of Julius Caesar. The youthful politician and orator, the middle-aged soldier, the ambitious and realistic statesman who labored for the public weal as well as for his own glory, succeed each other as the years unfold. Most of us are more or less familiar with Caesar, the conqueror of Gaul and the victor of Pharsalus. These campaigns are described possibly too succinctly. But after all Caesar led no legions to battle until after he was forty so that we may have emphasized too much the soldier in our conception of him. At all events Mr. Buchan's Caesar is not only the soldier, but the great leader and administrator who showed the way to scrapping the outworn machinery of the republic as it was organized, and laid the foundations for the great empire of Augustus.

Caesar was elected to the office of military tribune when he was twenty-eight years old. Mr. Buchan holds that at that time "he was clear about two things—that the aristocracy was no longer fit to govern, and that the traditional constitution of Rome was inadequate to its new duties." Advancing through various elective offices, Caesar was elevated to the consulship in 59 B. C., when he was forty-three. Even then Mr. Buchan denies that Caesar had laid the far-flung plans leading up to the dictatorship which some biographers insist he had already conceived fifteen years earlier. The campaigns in Gaul and the development of the military power that gave him the wherewithal to become supreme in Rome are compressed into a few pages, which are nevertheless clearly understandable.

The author's estimate of Caesar is summed up in these words: "His standards were human, but the highest to which humanity can attain, and his work may well be regarded as the greatest recorded effort of the human genius."

Mr. Buchan's "Julius Caesar" is a well balanced biography, delightfully written, and stimulating enough to lead us to study the authorities named in an excellent bibliography for further details of the man and his epoch.

CRY HAVOC! By Beverley Nichols. New York: Doubleday, Doran & Company, Inc. 1933. $2.50.

WE know of no better characterization of this absurd bit of pacifist propaganda than that which was applied to it by Colonel Hutchison of the British Army whose review was published in the *Army, Navy and Air Force Gazette* (London). Colonel Hutchison wrote that the treasonable statements of Mr. Nichols are the "Stifling poultices of internationalism." They are all that and more. Yet we venture to say that this book which attempts as its sole objective to spread the doctrine "under no circumstances fight for any ruler or any country" will soon be given a place of favorable prominence by many American readers who will not discover the insidiousness of the attack.

Mr. Nichols, whose previous best seller, "a book for everyone who has a garden, desires a garden or tends a garden," now ventures quite fearlessly into a field where emotion has been allowed to run away with better judgment. He indulges in the usual gibberish about the international munitions ring, describes his visits to an unnamed munitions plant in England where sales were made to the highest bidder regardless of nationality, to the Cruesot works in France where he was not shown very much and therefrom drew his own absurd conclusions, and a likewise unnamed gas-mask manufacturer which started him going on the horrors of gas warfare. All this kind of thing lambasted by the internationalist is not new regardless of the false assumptions and glaring exaggerations that are always used.

A reviewer, however, has no difficulty in detecting in hidden

away places the real theme of "Cry Havoc." It is a thinly veiled attack on authority of every kind. It admits sanction only of an internationalist state. It leans heavily to the "machine age" of Litvinoff.

This book is not worthy of review in these pages and would not be reviewed were it not for the fact that already it is beginning to be talked up in lavish terms. Says Mr. Nichols, "I believe with every fiber of my being that the hour has now struck in the world's history when every man who wishes to serve his country must realize that 'patriotism' is the worst service he can offer it." The dorcas societies will devour jargon of this type (the book being full of it) and laud it to the skies. It will be well for those of us who should know about "Cry Havoc" to condemn it unhesitatingly as a wanton attack on sane nationalism, an absurd picture based on alleged facts which the author might have investigated before arriving at conclusions, a deliberate challenge to the highest and noblest instincts of our race.

ONCE A GRAND DUKE. By the Grand Duke Alexander of Russia. New York: Farrar & Rinehart. $3.50.

THOSE who were thrilled by reading "The Education of a Princess" by the Grand Duchess Marie will enjoy reading this autobiography by the Grand Duke Alexander.

Alexander was a brother-in-law of the late Czar Nicholas II as well as an intimate associate for over forty years. The events which he records are first-hand and form a chronicle of an interesting life and of the times.

His early life was spent on his father's estate where his trials and tribulations had mainly to do with tutors. One of his playmates was "Nicky," later Czar Nicholas II. He furnishes a vivid account of the death of Alexander II.

Finding life at court too stifling, he sought his career in the Navy. These years were the happiest of his life and were filled with adventure. Returning to court, he attempted to promote a reorganization of the Russian fleet only to have his efforts laughed aside. The disaster of the Russo-Japanese war is laid to lack of a proper estimate of the difficulties of conducting a war 7,000 miles away.

During a long sojourn at Biarritz, Alexander became interested in the possibilities of aircraft as demonstrated by the flight of Bleriot over the English channel. By 1909 he had succeeded in establishing the foundation of the Russian Air Service over the opposition of the heads of the Army and Navy. He continued his connection with aviation and was appointed commander-in-chief of the Russian air forces during the World War.

This book supplies abundant evidence of the incapacity of Nicholas II. He came to the throne knowing himself unequal to the task. Numerous instances of this incapacity, of vacillation in critical situations, of trust misplaced, are cited.

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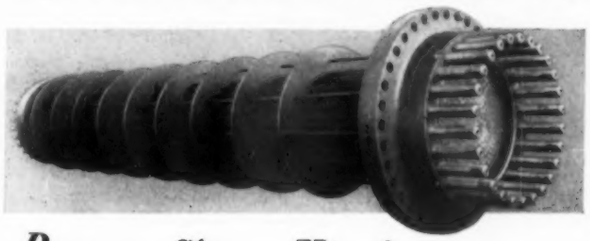

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(Above) One of four steam to steam reheaters, designed and built by Foster Wheeler Corporation, New York, for the Deepwater Station, Houston Lighting and Power Company. Because of its high resistance to oxidation in steam to steam reheater service, Foster Wheeler uses tubes of Chrome-Vanadium Steel.

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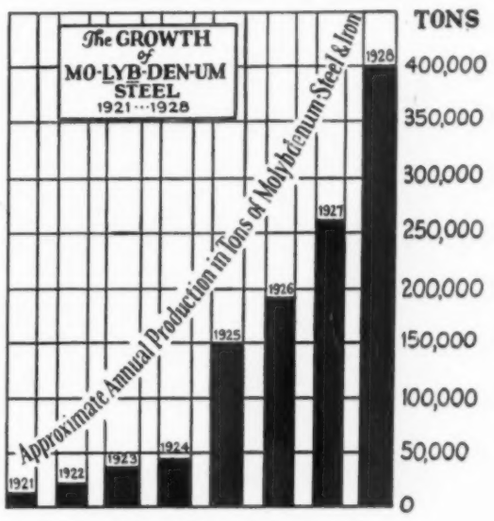

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Arabia Felix, Across the "Empty Quarter" of Arabia. By Bertram Thomas with a foreword by T. E. Lawrence and an Appendix by Sir Arthur Keith. New York: Charles Scribners Sons. $5.00.

EARLY in the year 1931, the last large blank space on the map of the world was filled in. Captain Bertram Thomas, a skilled English explorer, accomplished this feat by a daring dash across the desert Rub' al Khali, "empty quarter" of Arabia.

Captain Thomas has spent five years as Wazir to the Sultan of Muscat and Oman. These years were utilized in studying languages and dialects, tribes, feuds, religions and customs. All these preparations were a prelude to this great adventure which he had planned a year before.

A fortunate lull in blood feuds made the journey possible. A delay of six weeks occurred while two tribesmen went inland to collect camels and guides to conduct him across the desert. Shaikh Salih went ahead of the expedition to arrange for relays of men and camels. Provisions for the journey were carried as the country would afford no food supplies except forage for the camels and water.

Sometimes was spent in crossing the Qara mountains and skirting the edge of the desert. Finally on January 10, 1931, the dash began and on February 5, 1931, the party arrived at Doha on the Persian Gulf. The blank space had been filled in with six hundred miles of burning sand occupied by wandering bands of marauding Arabs.

Captain Thomas knew what others had written on Arabia so he has here put down only new things. He recites legends and gives details as to flora, fauna and customs. The book is illustrated with superb photographs of the desert and its denizens. The appendices give anthropological and zoölogical data collected by the author. There are also included a list of camel brands and the musical notes for some of the Arab chants. Finally there is included a map which is arranged in the most accessible manner yet encountered in any book. It is possible to have the map open and at the same time read the text! This is accomplished by having the map inserted in the back of the book with the portion blank which would be covered by the text of the volume.

Way of the Lancer. By Richard Boleslavski in collaboration with Helen Woodward. Indianapolis: Bobbs-Merrill Co. $3.00.

BEFORE the war Richard Boleslavski was an actor in and a director of theatrical productions. With this training, it is no wonder that "Way of the Lancer" is filled with dramatic incidents. His collaborator, Helen Woodward, was trained in advertising and is herself an author. The combination has produced a book written in a most effective style.

The author was a lieutenant in a small cavalry regiment of Poles, known as the Polish Lancers serving with the Russians. The story opens with the regiment in retreat in the fall of 1916 and glides to the abdication of the Czar on March 15, 1917. A thrilling account is given of the offensive in the spring of 1917 when the Russian Armies were under Kerensky. This regiment charged mounted against troops protected by barbed wire but due to mutiny on the part of the Russian troops they were forced to give up the positions they had occupied.

With the dissolution of the Russian Armies the wanderings of the regiment began. A few of the members joined with the revolutionists but the colonel by his personality was able to hold most of the men, hoping to get them all back to Poland.

The revolutionists were now moving on the regiment in order to annihilate it. The organization hid for several days but finally disbanded. The horses were disposed of and each man was left to make his escape as best he could. The book closes with the author boarding a train for Moscow with soldiers returning from the front. Here is fact in the guise of fiction.